JOURNAL

OF

ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

VOL. 4 OCTOBER, 1911 No. 5

FORMALIN FOR POISONING HOUSE FLIES PROVES VERY ATTRACTIVE WHEN USED WITH SWEET MILK

By R. I. SMITH, *North Carolina Experiment Station*

During the early part of June, 1911, while attempting to reduce the flies at the horse barns and dairy of the North Carolina Agricultural and Mechanical College, I attempted to poison them with formalin, and secured rather remarkable results. House flies (*Musca domestica*) were very numerous when the work was commenced, owing to the fact that the manure had been allowed to accumulate for six or eight weeks. In the milk room (which was screened shortly afterward) the flies covered the walls and ceiling, and the straining cloth at milking time was actually black with flies. In justice to the College and the writer, allow me to explain that this disgraceful condition was soon remedied and that during the past three months the dairy has been remarkably free from flies.

My previous experience with formalin for poisoning flies had been confined to using it a few times in the laboratory in the proportion of one part to twenty parts of sweetened water, but realizing that the poison must be made attractive if used successfully in the milk room of a dairy, I decided to try it with milk instead of water.

My first experiment proved successful. This was the addition of one ounce of 40 per cent formalin to sixteen ounces of fresh milk. This mixture was placed in four shallow tin plates and set on the floor of the milk room about 3 o'clock one afternoon. The flies commenced to feed and die within a few minutes, and continued to die rapidly even while the evening's milk was being brought in and strained. These plates of poison were left over night and the milkers advised me that the flies were feeding greedily the next morning soon

after daylight. The dead flies, swept up about eight A. M., measured about one pint, representing fully 5,000 flies.

This experiment was repeated for three successive days and about one pint of dead flies were swept up every morning. In addition to the flies actually secured many dropped dead outside the windows.

My next experiment was to use a mixture of half milk and half water instead of whole milk. Formalin was added in the same proportion, one ounce to sixteen ounces of diluted milk. This proved to attract the flies as well as whole milk.

Several variations in the proportion of formalin and milk were tested, but my conclusion is that the use of one ounce to sixteen is most effective. The following method of stating the formula has been used for newspaper articles, in order that every housekeeper can prepare it easily:

"One ounce (two tablespoonfuls) of 40 per cent formalin; sixteen ounces (one pint) of equal parts milk and water.

"This mixture should be exposed in shallow plates and by putting a piece of bread in the middle of the plate, it furnishes more space for the flies to alight and feed and in that way serves to attract a greater number of them. Whole milk can be used, but the diluted milk seems to be just as successful. The formalin can be purchased for fifty cents a pint."

A very conclusive test of the efficiency of the above formalin mixture was made in a large calf barn where flies were extremely numerous. Six plates of the mixture were placed in the passage way between the stalls. This passage way is about six feet wide and thirty feet long. The poison mixture was exposed at 12 o'clock, noon, and left until 8 o'clock the next morning. The dead flies when swept up measured three quarts, and certainly one half as many died in the stalls on each side. I estimated that we killed between forty and fifty thousand flies in twenty hours by this experiment.

At the writer's suggestion many housekeepers in Raleigh and West Raleigh have used the formalin as recommended above, and several have reported the killing of flies by the pint and quart. A gentleman in charge of a farm where a large horse barn is maintained tells me that he poisoned a gallon of flies the first day he tried the mixture. This statement was vouched for by other witnesses in whom I have perfect confidence.

A good place to expose the formalin mixture is on the front and back porches, where flies are frequently numerous, and waiting to enter when the doors are opened. I know of several people who have used it successfully in this manner.

The use of the formalin-milk mixture in dwelling houses has not

proved so successful, except in unscreened kitchens or dining rooms.

This poison was tested in the large College mess-hall—where over four hundred students can be seated—resulting in practically cleaning up all the flies in two days. Previous to that time the steward had been using tanglefoot fly paper, often having as many as thirty sheets exposed. Fully that number were present when the formalin was used, but in spite of them the flies were numerous.

Entomologists are aware that formalin as a fly poison has been condemned many times, especially so last year, as I am advised by Edward Hatch, Jr., chairman of the Fly-Fighting Committee of the American Civic Association. It is partly for this reason that I have taken so much space in recording my results with formalin.

West Raleigh, N. C., September 7, 1911,

THE USE OF SWEETENED POISONS AGAINST THE GRAPE ROOT-WORM AND THE ROSE CHAFER

By F. Z. Hartzell

Entomological research at the Vineyard Laboratory has been confined largely to exhaustive studies of a few of the more important insects infesting the vineyards in Chautuaqua county, N Y. Two species have been responsible for much loss during the last decade: the grape root-worm (*Fidia viticida* Walsh) and the Rose Chafer (*Macrodactylus subspinosus* Fabr.) Both of these insects have been studied extensively by a number of entomologists in the various grape regions of the U. S. and our literature details the several remedial measures that have been used.

The author reported experiments conducted against these pests during 1909–10.[1] During the present season these have been continued and additional data secured which confirms his first claims as well as showing that even better results may be secured by the use of two gallons of molasses where one was used before.

Grape Root-worm. This is the most important insect of the vineyards on the south shore of Lake Erie where it has been known since 1893 when Prof. F. M. Webster gave the first account of its destructiveness and later published its life history. Since then it has been studied by others especially by Prof. Slingerland, Dr. Felt, Messrs. Fred Johnson and A. G. Hammar, so that we have in addition to its life history, much data regarding the periods of abundance and

[1] A Preliminary Report on Grape Insect, F. Z. Hartzell, Bull. 331, N. Y. Agr. Expt. Station, Geneva, N. Y.

scarcity of the insect in the same locality for a period of over ten years.

The remedy used has been arsenate of lead and this has been combined with the Bordeaux mixture. Its use has given good results in the hands of most experimenters but there have been failures when the work has been done thoroughly and many of the vineyardists have had similar experiences. At first we were inclined to regard such failures as due to careless and indifferent spraying, believing that the men conducting the spraying either did not apply it thoroughly or applied it at the wrong time, but our experience in connection with a series of coöperative experiments where the work of spraying was carefully watched and which did not give the expected results, indicated that some other factor entered into the problem. As it was believed that the beetles migrated from sprayed to unsprayed vines and since no dead beetles could be found under such sprayed vines, we made a careful study of the failure to control the beetles by the ordinary spray.

About an acre of vineyard was sprayed a second time the same day, thus using 200 gallons to the acre and as the vines were not very luxuriant, almost every leaf was covered with the Bordeaux mixture and arsenate of lead. Sheets placed under the vines had no dead beetles the next morning but the vines were free from beetles where the day before were thousands. Another acre about an eighth of a mile away was sprayed with a mixture of six pounds of arsenate of lead and one gallon of molasses to each 100 gallons of water. The vines were sprayed once, using about 100 gallons of material to the acre. All the foliage was not covered as it is next to impossible to do so with stationary nozzles at one spraying. Sheets placed under the vines had a number of dead beetles the following morning and a few beetles were still feeding on the vines. This plainly was an example, on the one hand, of migration because of a distaste of the material used, and, on the other hand, a feeding on the poison due to its pleasant taste.

With this clue, during the present season, a large number of brands of arsenate of lead have been used in cage experiments in which both sprayed and unsprayed leaves were in the same cage. With every brand the beetles preferred to feed on the unsprayed foliage showing very plainly that they dislike arsenate of lead. Other cages where the poison was added to either glucose or molasses showed the beetles feeding greedily on the sweet material. This was also noticeable in the field experiments where the beetles were observed passing to those parts of the vine that were covered with the sweetened poison, thus plainly showing their tastes. Moreover, vineyards seriously infested

with beetles this summer were sprayed with the same material and the disappearance of the beetles occurred in from a few days to a week. The finding of their dead bodies told the story of their departure.

Let us now return to our failures and seek an interpretation. The portions of the vineyards where the use of Bordeaux and arsenate of lead gave poor results were composed of vines having a luxuriant growth of foliage so that the spraying of these vines, using four fixed nozzles on a side, applying 100 gallons per acre, showed between 80 and 90 per cent of the foliage covered with the spray. If any of the beetles migrated to other vines we were not aware of the fact but there were many of them feeding on the 10 per cent of foliage that remained uncovered.

At the time these insects are feeding on the foliage, the growth of the vines is very rapid so new leaves are developing and by two days after spraying there is fresh unsprayed foliage for them to feast upon. Thus they feed unmolested and in time lay their eggs thereby accomplishing the very thing we are aiming to prevent.

We believe that either the inability to cover the foliage especially where dense, with the present use of fixed nozzles or the use of improper nozzles accounts for all the failures to control the grape root worm by means of the Bordeaux mixture and arsenate of lead. Experiments show that the use of the molasses-arsenate of lead mixture gives superior results, since the inability to cover all the foliage is balanced by the habit of the beetles seeking the sweet and also the insects are killed instead of being driven to other vines as appears to be the case with other mixtures.

The formula we recommend is six pounds of arsenate of lead, two gallons of molasses and 100 gallons of water.

Rose Chafer. The behavior of this insect towards arsenate of lead alone or with Bordeaux mixture is similar to that of the root worm. This has been determined by cage experiments as well as field observations. The reasons that we find so many failures in attempts to control this pest are as follows: (1) the beetles come in enormous numbers, every blossom cluster having from one to a dozen feeding on it; (2) The first feeding on grape is confined largely to the blossoms and blossom buds. The attempts to spray the vines with fixed nozzles, often results in covering the foliage but not covering the blossoms and buds, so the beetles are not inconvenienced in feeding on these delicate structures. A single beetle can destroy a number of the flowers before eating sufficient poison to kill it, even though these parts should have some poison on them. Thus the crop of fruit will often be ruined in a few days and the migration of the insects to other plants will be of

little value to the vineyardist. Very thorough spraying will sometime cause them to migrate and thus save the crop.

Our experiments were first conducted with the aim of finding a more active poison than arsenate of lead but we learned from cage experiments that the rapidity with which the insects die shows little in favor of the theory that the molasses or glucose increases the action of the arsenate of lead, but we find that the beetles relish the sweet material so we have the same explanation for its effectiveness as with the grape root worm. This alone we believe is the cause of the great difference in efficiency between the two sprays. Field experiments conducted this season gave practically the same results as reported for 1910 in Bulletin No. 331 of the N. Y. Agricultural Experiment Station. We also proved that the use of two gallons of molasses is effective and less expensive than 25 lbs. glucose per 100 gallons of material.

The use of molasses with arsenate of lead in Bordeaux mixture gave the same results as when the arsenate of lead and Bordeaux were used alone. This we believe is due to the excess lime and copper hydrate counteracting the sweetness of the molasses. We regret that this is a fact as it leaves us without a fungicide unless we make extra sprayings after the rose chafer and grape root worm have been disposed of.

CALIFORNIA REDWOOD ATTACKED BY TERMES LUCIFUGUS ROSSI[1]

By WILLIAM B. PARKER, *Bureau Entomology, U. S. Department of Agriculture*

During January, 1911, while investigating the work of *Termes lucifugus* upon the roots of the hop vine, near Sacramento, California, the writer observed that many California redwood string pegs, used in stringing the yards, were infested by white ants. Many were hollowed out in the manner characteristic of the work of termites, only the outside shell remaining. Others were attacked on the outside, the grooves being covered with sand cemented together. Pegs which had remained in the ground over two seasons were found to be mere shells and full of termites. Last year's pegs although badly damaged were not in such bad condition.

White ants were also found in the trellis poles, in some cases the portion of the pole under ground being entirely destroyed. Such poles were supported by the trellis wire attached to the tops. They were of little value in supporting a crop of hops. Where moisture had risen in the wood above the surface of the ground, the termites followed

[1] Published by permission of the Chief of the Bureau.

it, in some cases working from three inches to a foot up the pole in the dry wood. Termites were also found in redwood fence posts and in the redwood sills of a small building standing in the infested yard. The termites were first noticed by the hop growers in April, 1908. The yard in which they first appeared was overflowed by the American river in January of the same year and when the water retreated, a large amount of driftwood was left on the ground. Since the termites were not seen before this time, it seems quite probable that they came in with the logs and when the water retreated, established themselves in the hop yard.

The California redwood has heretofore been considered quite immune to attack by the white ant. Dr. L. O. Howard in Bulletin No. 30 of the Bureau of Entomology U. S. Department of Agriculture under the title "On the Alleged Immunity of the California Redwood to Attack by Termites" quotes from a letter received from Mr. J. E. Norton of Manila. The experiments described in Mr. Norton's letter, indicate that the California redwood is immune to attack by white ants. Mention is made regarding the possible immunity of California redwood in Circular No. 50 of the Bureau of Entomology by Mr. C. L. Marlatt as follows: "Capt. Geo. P. Ahearn, U. S. Army, reports that California redwood has been used for more than twenty-five years in the Philippines, and has never been known to be injured by white ants." The work of these insects upon the string pegs and trellis poles in the hop yards near Sacramento, however, proves that, under some circumstances at least, this wood is subject to attack by *Termes lucifugus*.

NOTES ON TWO IMPORTANT PARASITES OF ECONOMIC INSECTS

By A. B. Gahan

The following incomplete notes are taken from the records of the Entomological Department of the Maryland Experiment Station, and are submitted in the hope that they will prove of interest to economic entomologists.

Telenomus quaintancei Gir.

This parasite in the eggs of the peach tree borer, *Sanninoidea exitiosa*, described by Girault in 1906 (*Psyche* XIII, p. 63), was reared by the writer September 9, 1911, from eggs collected at College Park, Md. Mr. E. N. Cory on August 21 brought to me a single female specimen which he had observed crawling over a cluster of borer eggs on a peach leaf. The mass of eggs was also secured and placed in a vial for

observation. September 9, five specimens of the same parasite emerged in the vial, indicating that the development from egg to adult in this parasite covers a period of about nineteen days. While not conclusive, it is reasonable to suppose that the bred specimens are the product of eggs laid by the above mentioned female shortly before she was captured. This is of importance, as showing the opportunity for a number of generations of the parasite during the normal egg-laying period of the moth.

Aphidius nigripes Ashm.

During the spring of 1909 there was a noticeable abundance of the European grain louse (*Macrosiphum granaria*) on the wheat, oats, barley and rye fields of the Experiment Station farm. On May 7, it was noticed that Aphidiine parasites were abundant in the fields and they continued so until the time of harvest. .Parasitized aphides were collected and parasites reared in considerable numbers. The majority of them proved to be the above named species, although another species identified as *Aphidius rosæ* Haliday, a common parasite of the rose aphis, was also present in considerable numbers.

In the early spring of 1910, further observations were obtained on the parasite. Specimens of *Aphidius* were first collected with a net in the rye fields on March 21, when two specimens were taken. On March 30 the parasite was much more abundant, fifty specimens being taken on this date. Of this number all except three were males. No aphides were discovered at this time on the rye, although some were doubtless present as they later became quite numerous. Search was made for parasitized aphid bodies which might have served as the over-wintering cocoons of the parasites, but none were located. It is not intended to imply by this that the parasites wintered as adults. The contrary is very probably the case, since the only species of Aphidiinæ whose hibernation have been observed winter as larvæ in the swollen bodies of their host. The predominance of males at this time and the absence of any parasitized aphides on the grain would seem to indicate that the specimens collected were those of the first over-wintering generation.

Another collection of parasites was made on April 11, and all were found to be males. The parasite was apparently less abundant than on the earlier date. A few aphides were found on this date but none showing parasitism. The latter part of March had been warm and balmy, accounting for the early abundance of the parasite. This was followed by much cold, wet weather in April, making it certain that many of the parasites must have perished.

Several subsequent observations taken during April and May showed that aphides were increasing in abundance and that the para-

site was present in small numbers, but it was not until May 25 that evidence was found of the advent of a new generation of the parasite. On this date several swollen bodies of lice were found and from two of these the parasites had already emerged. May 27 I was able to collect a considerable number of pupating parasites, and by the thirtieth, the dead, swollen bodies of the parasitized lice were very abundant on the leaves, stems and heads of both rye and oats. It was also noticeable that many of the large living aphides were of a very much darker color than normal and upon dissection these were invariably found to contain the nearly full grown larva of the parasite. It was also noted that these dark colored individuals were rarely surrounded with colonies of newly born aphides, as was the case with normal specimens, thus showing that reproduction had been stopped some time before the death of the louse, a fact having considerable bearing on the efficiency of the parasite, as previously pointed out by Professor Webster in his account of the *Lysiphlebus* parasite of *Toxoptera graminum*.

An attempt to determine the length of the life cycle of the parasite was unsuccessful, owing to the fact that it was carried out in an ordinary glass-covered insectary, the temperature of which proved to be too high for their development. Observations, however, warrant the belief that the normal development in June covers a period of from fourteen to sixteen days. The period from the death of the host until emergence of the parasite is usually about five days.

The parasites continued to increase in abundance until the grain was cut, by which time the majority of the aphides in the fields were parasitized. There can be but little doubt that had it not been for the presence of this parasite, the damage to the grain on the Experiment Station farm would have been severe in both seasons. As it was, little damage was done.

NOTES ON THE LIFE HISTORY OF THE TICK PARASITE *Hunterellus hookeri* Howard [1]

By H. P. Wood, *Bureau of Entomology*

Introduction

Only two hymenopterous parasites of the Ixodoidea or ticks have ever been discovered. About one of these (*Ixodiphagus texanus* How.) almost nothing is known. The other, belonging to the same tribe of encyrtine chalcidids, *Hunterellus hookeri* Howard, is of peculiar

[1] Published by permission of the Chief of the Bureau of Entomology.

interest. Though there are as yet some details lacking to a complete knowledge of the life history of this insect, we know its history in general. We submit this knowledge in the hope that we may soon be able to supply the remainder.

Hunterellus hookeri was first collected by the writer in the nymphs of *Rhipicephalus sanguineus* Latreille (=*texanus* Banks) on April 20, 1908 at Corpus Christi, Texas. Doctor L. O. Howard described the species in the *Canadian Entomologist* for July 1908 p. 239–241. Search made in 1909 by C. W. Howard in Portuguese East Africa resulted in his finding this same species attacking *Rhipicephalus sanguineus* nymphs at Lourenco Marques. On June 18, 1910, two nymphs of *Dermacentor parumapertus marginatus* were received at the Dallas laboratory which were taken on a jackrabbit (or a dog?) by Mr. McLure Lewis, a correspondent at Green Valley, California. When the nymphs were received at Dallas, one of them was found to be parasitized. The nymphs were placed on sand and on July 1st, thirteen parasites emerged from one of them. The other nymph molted to a male *Dermacentor parumapertus marginatus*. The nymph from which the parasites emerged was determined by Mr. N. Banks as the same species. The parasites were determined by Doctor Howard as *Hunterellus hookeri*.

Two hosts are known, *Rhipicephalus sanguineus* and *Dermacentor parumapertus marginatus*. A brief outline of the life history of these ticks is essential to an understanding of the life history of the parasite.

The two species may be grouped together for the purpose, as their life histories are nearly the same. The eggs, which are deposited on the ground, hatch and the larvæ come forth ready for a host. Upon finding a host the young ticks feed until replete with blood. They then drop to the ground, seek a crack or crevice for protection and there undergo the transformation to the nymphal stage. The nymph engorges to repletion, after which it drops to the ground to molt. While the nymph is engorging or after it has become engorged, parasitism takes place. Both male and female adults, like the other two stages, wait on grass for the appearance of a host. A host found, the adult ticks feed and mate.

It was first supposed that the insect was confined to a limited territory, but late collections indicate a wide range. To date, the species has been taken at Corpus Christi and Brownsville, Texas, also Green Valley, California in the United States, and from Monterey, Mexico[2] and from Lourenco Marques, Portuguese East Africa.

[2] November 25, 1909, Mr. F. C. Bishopp and Mr. E. A. Schwarz collected nymphs of *R. sanguineus* from dogs. Some of these were parasitized, but the parasites never matured and the determination is based on immature specimens.

Life History and Habits

In describing the life history of the parasite, we shall start with adults emerging from a small round opening at the posterior end of the nymph. (See Pl. 17, Fig. 5). The insects often encounter considerable difficulty in getting out through the small passage way. Should the nymph become somewhat dry, it occasionally happens that the parasites are unable to emerge. As soon as the male has extricated itself, it immediately seeks a female. Once free, the female awaits the male, meanwhile preening her antennae and wings with her forelegs. The male rapidly fertilizes the females, the sexual act requiring but a few seconds. As soon as she is fertilized the female starts off hastily in search of her victim. To the tick larva the parasite pays no attention, but attempted oviposition has been observed in both a male and unengorged female of *R. sanguineus*. All that the parasite requires is a nymph at least partially engorged. In nature both nymphs on the ground or on the host seem to be attacked. On the host animal the tick parasite is perfectly at home crawling through the hair as naturally as a flea. A nymph which has become quiescent before molting seems to be in no danger from the parasite. It appears to delight in motion on the part of its victim. When crawling about on the tick host, the parasite makes little use of its wings, but when free the insect moves about in short flights. Often the parasite will insert its ovipositor immediately after reaching the nymph, but sometimes it takes a few seconds of examination and at other times longer. After inserting its ovipositor, which remains inserted from about two to twenty seconds, the parasite usually leaves its host and seeks another victim. It may, however, wait and insert its ovipositor again, but never has been observed to oviposit more than twice in the same tick. Although feeding is not necessary before oviposition, this parasite has been seen to imbibe sweetened water when offered the chance.

In from eight to fifteen days in October the characteristic striped appearance (See Pl. 17, Fig. 12) of the parasitized nymph becomes evident. In about forty-four days during October and November, the parasites emerged as adults. The parasitic period within the nymphs is very nearly the same as the molting period of the nymphs.

A study of the accompanying table (No. 1) will give some idea as to the number of parasites per tick, the proportion of sexes[3] and the time spent by the parasite within the nymph.

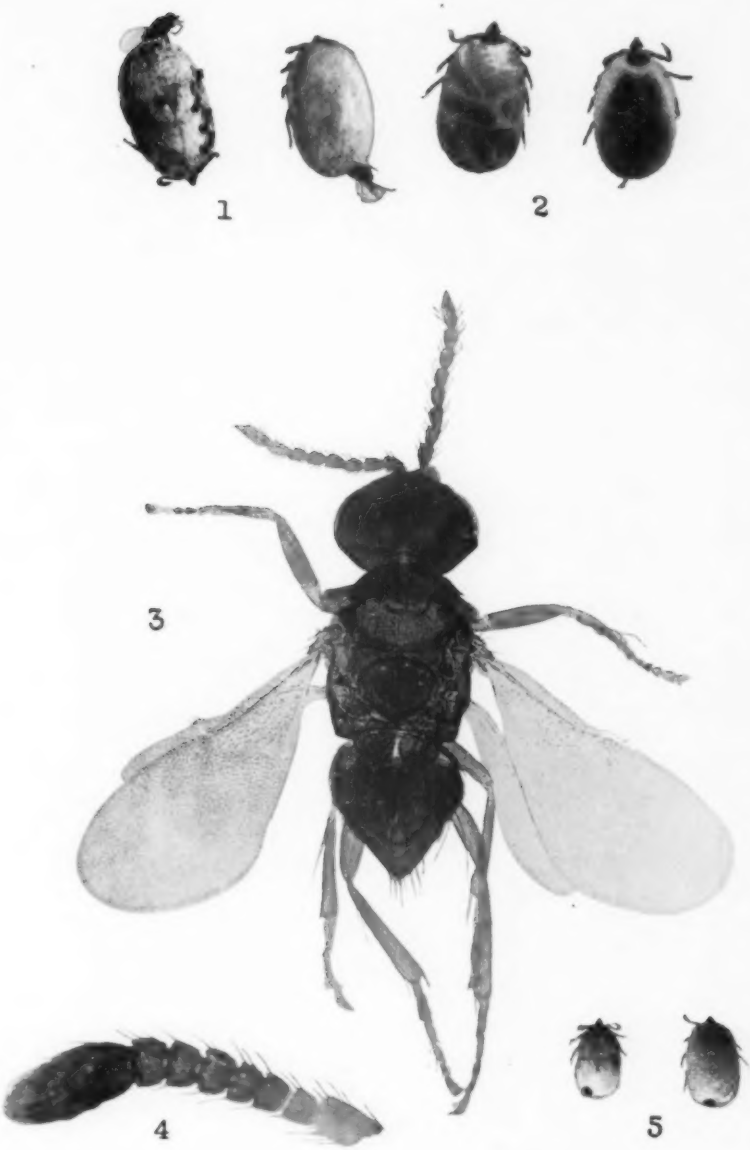
---

[3] The sexes are easily distinguished by the difference in the antennae. The segments of the antennae of the female are broader than long with the end segment club shape, while in the male the segments are longer than broad, the end segment being the same width as the others. Compare Pl. 17, Figs. 3 and 4.

RECORD OF PARASITES (*HUNTERELLUS HOOKERI*) REARED FROM *RHIPICEPHALUS SANGUINEUS*

Host collected	No. Nymphs	Days to emerge	Parasites emerged ♂	♀	?	Total
1908						
Apr. 20	1	32				10
" "	1	32				17
" "	1	33				6
" "	1	33	5	6		11
" "	1	33				6
May 28–29	1	22 or 23	1	5		6
" "	1	22 or 23	1	4		5
" "	1		1	3		4
" "	1	22 or 23	1	8		9
" "	1	23 or 24	1	4		5
" "	1	23 or 24	0	6		6
" "	1	23 or 24	1	4		5
" "	3 (*a*)	20 or 24	3	10		13
" "	3 (*b*)	21 or 24	2	8		10
" "	3 (*c*)	22 or 23	3	10		13
" "	1	24 or 25	1	5		6
" "	1	24 or 25	0	3	1	4
" "	1	24 or 25	2	4		6
" "	1	24 or 25	2	2		4
" "	1	24 or 25	0	4		4
" "	1	24 or 25	2	6		8
" "	1	24 or 25	3	6		9
" "	1	24 or 25	4	6		10
" "	1	24 or 25	2	3	1	6
" "	1	24 or 25	2	11		13
" "	1	24 or 25	2	11		13
" "	1	24 or 25	1	5	1	7
" "	1	24 or 25	3	3		6
" "	1	24 or 25	1	5		6
1908						
May 28–29	1	24 or 25	2	4		6
" "	1	24 or 25	2	8	2	12
" "	1	24 or 25	1	7	2	10
" "	1	24 or 25			4	4
" "	1	24 or 25			5	5
" "	2	24 or 25	2	2	1	5
" "	1	25 or 26	0	3		3
" "	1	25 or 26	3	3	2	8
" "	1	25 or 26	1	6		7
" "	1	25 or 26	1	6		7
" "	1	25 or 26	2	6		8
" "	1	25 or 26	4	6	1	11
" "	2	25 or 26	0	5		5
" "	1	25 or 26	1	3		4
Oct. 16, 1908	1	30				6
" "	1	31				8
" "	1	51				8
Nov. 6, 1908		66				3
" "		67				8
Sept. 9–10, 1909	1	29 or 30				5
" "	1	32 or 33				6
" "	1	32 or 33				4
" "	1	32 or 33				3
" "	1	32 or 33				4
" "	1	32 or 33				3
" "	1	32 or 33				3
" "	1	33 or 34				4
Nov. 25, 1909	1	Removed				5
" "	1	"				3
June 11, 1910	1	30				13

(*a*) = 6 from one nymph.
(*b*) = 7 from one nymph.
(*c*) = 5 from one nymph.



Hunterellus hookeri Howard:—Fig. 1, Parasites emerging from nymphs of *Rhipicephalus sanguineus* Latr. x 6.3; Fig. 2, Nymphs of *R. sanguineus* showing characteristic appearance following parasitism, x 6.3; Fig. 3, *Hunterellus hookeri*, male, x 54; Fig. 4, antennæ of female of same, x 1450; Fig. 5, emergence orifices in nymphal ticks, x 3.6.

The percentage of parasitism varies considerably in the same locality. We have been able to secure at times an abundance of parasitized ticks at Corpus Christi, Texas, while at others, though it may have been very near the same season of the year, either no nymphs were found or the nymphs found were not parasitized.

The records in the table show the production of about one male to three females. As may be seen the proportion of males to females in a single nymph varies considerably, although it usually happens that there is an excess of females and in no case has the proportion of males exceeded that of females. The maximum number of parasites per tick was seventeen, the minimum three and the average eight. It took from twenty to sixty-seven, with an average of thirty-two days from the date of collection for the adults to emerge.

Description of Parasitized Nymph

For several days after being parasitized the nymph appears normal. The first indication of parasitism is swelling, soon followed by an irregular striped appearance (See Pl. 17, Fig. 2) caused by the larvæ of the parasite as seen through the nymphs' skin. This appearance gradually passes away as the body fluids are taken up by the parasite. Just before emergence, the front end of the body is black and the posterior part yellowish translucent. This is more pronounced in some cases than in others.

Artificial Parasitism

Early attempts to breed the parasites proved failures. Mr. W. A. Hooker's trials gave negative results, as did also the author's early tests. This was probably due to the extreme heat when the attempts were made. Our efforts finally proved successful and it was found very easy to breed the parasite, using *Rhipicephalus sanguineus* as a host. It si quite likely another generation might have been bred but for cold setting in.

Considerable difficulty was anticipated in breeding the parasite owing to its minuteness. The head and body length measures only about one millimeter. A large box was prepared in which the breeding was to be done. In actual practice, however, this box was found to be of no value. When the tick was attached to its host, it was necessary simply to allow a female parasite its freedom on the host. It would search out the nymphs. When the nymph was free, it was only necessary to put a glass over the parasite and nymph to prevent their escape.

The table below shows the results obtained in the breeding experiments:

TABLE II. RECORD OF RESULTS OF BREEDING OF *H. HOOKERI*

Parasitized	No. Nymphs	Date Emerged	Parasites emerged				Days to Emerge	Temperature (F.)		
			♂	♀	?	Total		Max.	Min.	Mean.
Oct. 12, 1909.....	1	Nov. 26	1		8	9	43	94	41	72.05
Oct. 13, 1909.....	1	Nov. 26	1		9	10	44	94	41	69.03
Oct. 14, 1909.....	1	Nov. 27				8	44	94	41	*

Besides those that emerged successfully there were five other nymphs that were parasitized at the same time, but which failed to produce adult parasites. When the nymphs were opened, one produced ten; one, thirteen; one, eight; and one, eleven adults; and the fifth nymph was found to contain four immature stages. An attempt was made to carry these parasites another generation, but without results, the failure due possibly to the lateness of the season. One tick which produced thirteen parasites appeared to be parasitized only about three times; in no case as many as thirteen times. This might suggest that the parasite deposited several eggs each time she inserted her ovipositor, or possibly some form of polyembryony.

Economic Importance

Several attempts have been made to cause the parasite to develop on hosts other than those on which it was collected, but thus far without positive results. It seems, however, since the parasite naturally breeds on at least two widely separated genera that further experiments should prove successful. It is true that the abundance of *Rhipicephalus sanguineus* varies greatly where the parasite is found but how much of this variation is due to the parasite cannot be determined without further study. In any case, *R. sanguineus* has always been found in sufficient numbers in south Texas to prove that the tick is able to thrive in spite of the parasite. The effect can be one of only partial control.

On November 14, 1908 a shipment of 200 nymphs, divided into two lots, one in a wooden box containing tissue paper, the other in a mailing tube containing green sawdust, were sent to Prof. C. P. Lounsbury at Cape Town, South Africa. Parasites emerged from each lot, but attempts to cause attack of the South African ticks were failures. Other lots of nymphs were collected in south Texas and shipped to Mr. C. W. Howard at Lourenco Marques, Portuguese East Africa and to Prof. P. Silvestri, Portici, Italy. In neither case were the parasites successfully reared.

* In refrigerator one day before emergence.

I wish to acknowledge the assistance in the work upon which this paper is based of Dr. L. O. Howard and Messrs. F. C. Bishopp and W. A. Hooker.

A NOTE ON XYLOCRABRO STIRPICOLA PACK

By A. B. Gahan

While records of the nesting habits of Crabronidæ are not wanting in entomological literature, the following observations are believed to be of sufficient interest for publication.

Early in March of the present year (1911) the Entomological Department of the Maryland Experiment Station received from a correspondent in Hagerstown a lot of twigs of *Catalpa bungei*, accompanied by a letter stating that a young tree was being badly injured by some insect boring in the twigs. Examination of the twigs revealed the fact that they were being utilized by some species of Crabronid as a nesting place. In some cases the stems had been hollowed out to a depth of twelve to fifteen inches, and had, of course, been killed for that distance. Some twigs contained as many as twenty-five or thirty of the larvae, each in its separate cell.

The larvæ at time of receipt were plump, pure white grubs with the abdominal spiracles quite prominent. Each was enveloped in a thin, pale, brownish cocoon. They were evidently just beginning to pupate, as the constriction between the abdomen and thorax was already appearing.

The cells containing the larvæ were separated by chewed up bits of the pith, and in the end of each cell was a mass of fragmentary remains of the insects which had served as the larval food. Examination of these fragments indicated that the principal part of the food had consisted of a small metallic blue-green Dipteron of the family Stratiomyidae. In some instances the remains of a grayish species, apparently of the same family, were found.

Adults were obtained from the twigs on May 8, 1911, and proved to be *Xylocrabro stirpicola* Packard. Professor Riley has recorded the finding of nests of this species in Osage Orange, and there are other records of its having been found in raspberry. The probable explanation for its choice of this catalpa as a nesting place and the accompanying injury, is to be found in the fact that the tree had evidently been pruned, leaving the soft pith exposed and furnishing an ideal and inviting place for the wasp to nest.

STUDIES IN THE BIOLOGY OF THE BOLL WEEVIL IN THE MISSISSIPPI DELTA REGION OF LOUISIANA[1]

By R. A. CUSHMAN, *Bureau of Entomology, U. S. Department of Agriculture*

The information contained in the following pages was obtained in a series of studies in the life history and biology of the boll weevil, carried on by the writer at the Delta Boll Weevil Laboratory at Tallulah, La. Owing to the fact that what work was accomplished along these lines was done in what time could be spared from other investigations, the methods employed were more or less crude and the results obtained somewhat meager. However, the data obtained are of considerable interest and very suggestive of opportunities for future investigation along similar lines.

The experiments were started with the idea of determining the maximum and minimum number of generations during a season, but as the work progressed new lines of investigation presented themselves, and several of these were studied to some extent.

As no provision had been made to have cotton in the proper stage at an early date and since the season was very backward, the beginning of the work was unavoidably delayed until June 21, when squares began to appear in the field. On account of the lack of time necessary for carrying on the work in plant cages, it was necessary to utilize picked squares and cages of various sorts. This introduced the first unnatural condition. In nature, an infested square stays on the plant six or seven days after being punctured, during which time it grows and retains its moisture to a large extent. Under the conditions as imposed in the experiments the squares began drying before being infested. This had the effect of limiting the food supply of the developing larvæ, and caused a large percentage of the weevils reared to be small, poorly developed individuals. This was not particularly noticeable during the hotter weather, when the developmental period was of short duration; but late in the season, when the developmental period was some days longer, it became such a serious matter that very few weevils were reared, and the work had to be concluded before breeding in the field had ceased. This difficulty was increased by the necessity of importing squares from Texas during September and October, owing to the practically total infestation at Tallulah. The failure to determine the point originally intended was due to this factor.

Throughout the work the squares either dried or rotted badly, according as they were placed after infestation in well ventilated or

[1] Published by permission of the Chief of the Bureau of Entomology.

close breeding cages. Nevertheless, eight hundred and sixty-eight weevils, having developmental periods ranging from eleven to nineteen days in duration were reared, and on these the data and conclusions in the following pages are based.

Methods

In starting the work eleven hibernated female weevils and as many males taken in the field were used. The females were captured as follows: five on June 21, two on June 22, and four on June 23. These were paired and each pair placed in a tumbler, closed by a square of cheese cloth, with cotton squares from which the involucres had been stripped. The squares were renewed daily and examined for egg punctures, the infested ones being placed in breeding jars, each jar containing the squares infested by all the weevils during one day. Throughout the oviposition period careful daily record was kept of the number of eggs deposited and the number of squares infested by each weevil. The female weevils were numbered H. 1 to H. 11 (meaning hibernated weevil No. 1, etc.). The males were removed as soon as oviposition was well under way. H. 1 was discarded from the series on June 27, as it had, up to that time, not oviposited, and H. 4 was thrown out on June 30, having deposited only two eggs. No weevils were reared from the eggs of this individual.

It was originally planned to use the earliest ten female weevils and the latest ten of each generation throughout the season. The number of generations reared from the earliest females would be the maximum and the number reared from the latest females the minimum number of generations possible during the season. This was carried out to the fourth generation with the earliest females, but of the latest females only those of the first generation were reared. At the time when the last eggs of the latest first generation weevils were being deposited, about the middle of September, the squares from Texas were being used, and very few adults were reared. Moreover, no squares except those from Texas were obtainable, and no attempt was made to carry the work beyond the first week of October.

Each of the female weevils which were kept for breeding the next generation was labeled with the number of the generation to which it belonged together with a letter, indicating whether it was one of the earliest or one of the latest of its generation. Thus weevil No. 4.c was the third earliest female weevil of the fourth generation and No. 1.y was the next to the last of the first generation. Each female was placed with a male in a tumbler, given fresh squares daily, and otherwise treated exactly as were the hibernated weevils.

The male weevils used were obtained sometimes from the field and sometimes from the breeding cages.

The squares infested by each series of weevils were kept in separate lots, but all those infested by the weevils of a given series during one day were placed in a common breeding cage. Thus each lot of infested squares represented one day's work of all the weevils of one series.

In order to equalize as far as possible the humidity surrounding the various lots of squares, small lots were placed in tumblers or even in large tubes with cheese cloth covers, while larger lots were placed in lantern chimneys with a square of cheese cloth over each end. The last were placed on their sides to admit of a free circulation of air about the squares. In spite of these precautions many of the squares dried too rapidly, while others became sodden and decayed badly. The greatest difficulty was experienced with the earliest infested squares of each generation, always small in number, which dried so rapidly that few of them produced adult weevils.

The methods employed in the more minute studies of the various stages and in obtaining data on other points will be described under the several topics.

Oviposition

In depositing an egg within a square, the female weevil first tests the square minutely, running over it excitedly and feeling it with the antennæ. Finally selecting a suitable place, usually on the surface of the calyx toward the base of the square, she begins drilling a hole by pulling off a little flake of the outer epidermis. Then, with her feet strongly braced and by gnawing and pushing with an augur-like motion, she thrusts her beak into the tender portion of the square. At the bottom of the puncture she makes a small cavity by gnawing, at the same time moving about the hole with the beak as a pivot. Withdrawing her beak she turns about with the center of her body as a pivot. This places the tip of her abdomen directly over the puncture, into which she thrusts her ovipositor, depositing a single egg in the chamber at the extreme end of the puncture. As she withdraws her ovipositor she plugs the puncture with a particle of excrement, pressing it down with the tip of her abdomen.[1]

Sometimes the weevil fails to locate the puncture immediately with her ovipositor. In this event she searches excitedly, moving the tip of the abdomen about, feeling carefully over the surface of the square. In this search, however, she never moves her front feet, evidently

[1] In the progress of the work many egg punctures were observed which were not plugged with excrement. These could, with a lens, be distinguished from the feeding punctures by a thin film of moisture closing the puncture just below the surface of the square, and due to the moisture from the ovipositor.

using the position of these as a guide to the distance through which she should search. Failing to locate the puncture in this way, she again turns around and searches for it with her beak and antennæ. If still unsuccessful she abandons the search and makes a new puncture.

Several weevils were watched during the act of oviposition and the various portions of the process carefully timed. The time required for making the puncture varied from 1 min. 20 secs. to 8 mins. 27 secs., with an average of 3 mins. 36 secs. In but two cases did the weevil fail to locate the puncture with the ovipositor immediately. In one case the weevil found it after 1 min. 15 secs., and in the other after several minutes search the weevil abandoned it and started a new puncture. For the deposition of the egg and the sealing of the puncture the time required varied from 35 secs. to 1 min. 40 secs., with an average of 59 secs. The total time for the whole process varied from 2 min. 45 secs. to 9 mins. 30 secs., with an average of 4 mins. 41 secs. Exclusive of the time lost in hunting for the puncture, one of the weevils accomplished the act in 1 min. 55 secs.

Periodic Division of Daily Oviposition

For observations on this point the day was divided into five periods as follows: early morning, from daylight to 9.00 a. m.; late morning, 9.00 a. m. to 1.00 p. m.; early afternoon, 1.00 p. m. to 5.00 p. m.; late afternoon, 5.00 p. m. to dark; and night, dark to daylight. At the time the observations were made, from 5.00 p. m. July 20 to 5.00 p. m. July 22, daylight occurred at about 4.00 a. m. and dark at about 7.30 p. m. The two days were partly cloudy but bright and the two nights clear and moonlight. During the entire time the weevils were kept in large tubes on covered porches, during the day at the laboratory and during the night at the observer's home. At the end of each period all of the squares were removed and fresh ones supplied. All infested squares were opened to verify the fact of oviposition. The first generation weevils, 1. a–k (exclusive of 1. h), ten in number, were used. Weevil 1. b was eliminated from the results, as it deposited only one egg during the two days.

The figures obtained show that of the nine weevils six deposited eggs during the night period. On the first day the four daylight periods ranked in hourly oviposition as follows: late afternoon, early afternoon, early morning, and late morning, the weevils being much more active in the latter half of the day. On the second day the preference for the afternoon is again shown, but these two periods are reversed in order, as are also the two morning periods. The total results, obtained by adding the two days oviposition, are given in Table I. This table shows that, although there was a decidedly

larger percentage of eggs deposited in the early afternoon, the rate of oviposition is faster in the later period. There is apparently little preference on the part of the weevils between the two morning periods. The record of weevil 1. c is omitted from this table, as it died during the second day, and its record is therefore incomplete.

TABLE I

SUMMARY OF PERIODIC DIVISION OF OVIPOSITION

Period	Total eggs laid	Time in two days	Average No. eggs per hour	Per cent total oviposition in each period	Average eggs per weevil per hour.
5 p. m.–7.30 p. m.	25	5 hours	5.00	23.15	0.63
7.30 p. m.–4 a. m.	10	17 "	.59	9.26	0.07
4 a. m.–9 a. m.	21	10 "	2.10	19.44	0.26
9 a. m.–1 p. m.	17	8 "	2.13	15.74	0.27
1 p. m.–5 p. m.	35	8 "	4.38	32.41	0.55

Total, Daily, and Maximum Oviposition and Oviposition Period

Since only enough eggs from the first weevils of each generation were needed to insure a supply of female weevils for the subsequent generations, these weevils were not fed beyond a few days. No data were therefore obtained on their total oviposition. Data of this sort were obtained only for the hibernated weevils and the latest weevils of the first generation.

Oviposition of hibernated weevils.—After the discarding of weevils H. 1 and H. 4 nine hibernated weevils were left for carrying on the observations. These began ovipositing within from one to six days after being placed in the cages. The oviposition period lasted from fourteen to fifty-three days, during which time the weevils deposited from 51 to 304 eggs. The average oviposition was 203.33 eggs and the average period 34.44 days. The average daily individual oviposition varied from 3.4 to 7.66 eggs, with a total average of 5.9 eggs per day. The maximum number of eggs deposited by any weevil during one day was twenty. In all probability, had these weevils been at large, the oviposition period would have been longer and the average daily and maximum oviposition smaller, as the great abundance of squares and the elimination of the search for them undoubtedly conduced to rapid oviposition. Probably also the inability of the confined weevils to remate had some effect on the oviposition. The life of the weevils after the completion of oviposition varied from death on the last day of oviposition to ten days after the last egg, although only two of the nine lived more than three days.

The results of these observations are summarized in Table II.

TABLE II

SUMMARY OF OVIPOSITION OF HIBERNATED WEEVILS

Weevil No.	Date placed in cage	Date first egg	Date last egg	Date of death	Oviposition period. Days	Total number eggs	Average daily oviposition	Maximum No. of eggs one day
H. 2.....	June 21	June 23	July 29	July 30	37	248	6.70	16
H. 3.....	" 21	" 27	" 10	" 16	14	66	4.71	8
H. 5.....	" 21	" 22	" 13	" 14	22	115	5.23	14
H. 6.....	" 22	" 25	" 9	" 10	15	51	3.40	9
H. 7.....	" 22	" 24	Aug. 15	Aug. 25	53	229	4.32	16
H. 8.....	" 23	" 24	" 11	" 14	49	282	5.75	16
H. 9.....	" 23	" 24	" 3	" 6	41	242	5.90	17
H. 10.....	" 23	" 21	July 31	" 2	38	291	7.66	18
H. 11.....	" 23	" 24	Aug. 3	" 3	41	304	7.41	20
Totals.....						1,830		
Averages.....					34.44	203.33	5.90	14.9

Oviposition of latest first generation weevils.—The work was concluded while the latest of the first generation weevils were still ovipositing, but somewhat desultorily. The work with these weevils was, however, carried on over a period of 49 days and some data of interest were obtained. Of the nine weevils, of which the lot originally consisted, four died without producing any eggs and one was lost after five days of ovipositing. Of the four remaining, one was ovipositing throughout the 49 days, one for 44 days, and one for 43 days, while the fourth had apparently ceased ovipositing after 47 days. During the above periods the weevils deposited the following numbers of eggs: 295, 211, 183 and 198. The average total oviposition for the four weevils was 221.75 eggs. The average daily oviposition was 4.78 eggs, and the maximum number of eggs deposited by any one weevil during one day was twelve. These results are summarized in Table III.

TABLE III

SUMMARY OF OVIPOSITION OF LAST WEEVILS OF FIRST GENERATION

Weevil No.	Date first egg	Date last egg	Oviposition period, Days	Total number eggs	Average daily oviposition	Maximum number of eggs one day
1. r.....	Aug. 21	Oct. 6	47	198	4.04	9
1. s.....	" 21	" 8	49	295	6.02	11
1. z.....	" 26	" 8	44	211	4.79	12
1. z.....	" 27	" 8	43	183	4.26	9
Totals.....				887		
Averages.....			45.75	221.75	4.78	10.25

The Life Cycle

The life cycle of the weevil may properly be divided into three periods: the developmental, preoviposition (the time between emergence and the beginning of oviposition), and oviposition periods. The last has already been discussed. The developmental period may be divided into the egg or incubation, larval, pupal and postpupal or teneral adult periods. The last is the time after the casting of the pupal skin, during which the weevil remains in the pupal cell.

Preoviposition Period

Data on this period in the life of the weevil was obtained from 43 weevils, representing the earliest individuals of generations one to four and the latest of generation one. As far as possible the date of copulation was obtained. This date is, however, very liable to error, since this act may be repeated between the same two weevils a number of times and even after oviposition has commenced. The time observed to have elapsed between emergence of the female and copulation varied in thirteen cases from two to seven days. In one of the two cases, in which seven days had elapsed, the original male weevil died on the sixth day and a new one was substituted. On the seventh day the pair were in copula and two eggs had been deposited. In the other seven day case copulation was also observed on the date of first oviposition. Copulation must, therefore, have taken place sometime before observed, in all probability by the third day. These observations, therefore, mean little except as they show the minimum time required for the proper maturing of the sexes for copulation.

As mentioned above, the minimum time from emergence of the females to copulation was two days. The male in this pair was, however, one day older than the female, and copulation in this case may have been due entirely to the extreme amour of the male, and does not necessarily mean that the ovaries of the female were ripe for fertilization. In two cases the time elapsed between emergence and copulation was three days. In one of these pairs the male was four days old at the time of copulation, and in the other both sexes were of the same age. These three cases would seem to indicate that the normal time necessary for the ripening of the sexual organs in both sexes is about three days.

The total period from emergence to oviposition varied from five to twenty-three days. The seven longest periods occurred in the weevils taken as the earliest of the fourth generation. Three of these were reared from squares infested by the latest weevils of the first generation and the rest, from those infested by the early third generation weevils. The long time required by these weevils is probably partly due

TABLE IV

SUMMARY OF PERIOD FROM EMERGENCE TO OVIPOSITION

Weevil groups	Date of emergence	Date of copulation	Number of individuals	Days emergence to copulation			Date of first egg	Number of individuals	Days emergence to oviposition		
				Min.	Max.	Mean			Min.	Max.	Mean.
Earliest weevils of first generation	July 8–11	July 13–15	9	2.00	7.00	4.33	July 14–19	11	5.00	8.00	6.00
Earliest weevils of second generation	July 29–31						Aug. 5–7	7	5.00	8.00	6.29
Latest weevils of first generation	Aug. 14–22	Aug. 19	1	5.00	5.00	5.00	Aug. 21–27	7	5.00	7.00	6.29
Earliest weevils of third generation	Aug. 19–21	Aug. 22–26	3	3.00	7.00	5.33	Aug. 26–28	9	6.00	9.00	6.89
Earliest weevils of fourth generation	Sept. 10–20						Sept. 18–Oct. 8	9	8.00	23.00	12.89
Totals and averages			13	2.00	7.00	4.46			5.00	23.00	7.72

to the fact that they were reared at the time when the larval food was insufficient, on account of the long period required for development and the poor condition of the squares supplied. They do not, therefore, probably represent the normal time required by weevils at that season, but exceed this time by several days. The average time of 7.72 days is also probably somewhat in excess of the normal average.

The number of eggs produced on the first day of oviposition shows remarkable variation, from one to seven. Of the forty-three weevils, sixteen produced one egg and thirteen two eggs; in other words more than 67 per cent of the weevils deposited, on the first day of oviposition, less than three eggs. Some of the others responded more readily to the incentive furnished by the abundance of squares and probably exceeded their normal habit.

A summary, by groups, of the results of these observations are shown in Table IV.

Developmental Period

Incubation period.—Data on the incubation period were obtained from six lots of eggs. Of these, four lots, deposited June 27 to July 4, showed a period of about three days, and two lots, deposited July 8–10, gave a period of about two and a half days. A study of the average temperatures during the incubation periods of these six lots of eggs shows that the average maximums for the eggs having the shortest incubation periods were much higher than for those requiring the longer period, the means slightly higher, and the minimum slightly lower. This indicates that the maximum temperature is the determining factor in the duration of the incubation period. This is shown very clearly in Table V.

TABLE V

TABLE SHOWING RELATION BETWEEN INCUBATION PERIOD OF BOLL WEEVIL AND TEMPERATURE

Date of oviposition	Date of examination	Days elapsed oviposition to examination	Number of individuals	Number unhatched	Number hatched	Estimated duration incubation period	Average temperature during incubation period		
							Max.	Min.	Mean
June 27–28	July 1	3.5	6	1	5	3.0	86.4	69.7	78.1
" 28	" 1	3.0	4	3	1	3.0	86.3	69.2	77.8
" 29	" 2	3.0	10	4	6	3.0	86.8	69.2	77.8
July 3–4	" 7	3.5	several	0	all	3.0	86.6	71.8	79.3
" 8–9	" 11	2.5	12	1	11	2.5	91.0	68.8	79.9
" 9–10	" 12	2.5	10	2	8	2.5	91.7	69.3	80.5

For determining the duration of the several stages of the developmental period beyond the egg, a start was made with 107 eggs of known date. The date of hatching was estimated on the basis of the incubation period as previously determined. Of the eggs used nine were deposited June 27–28, five June 29–30, thirteen June 30–July 1, forty July 1–2, twelve July 3–4, and twenty-eight July 6–7. The incubation period for the last of these lots was placed at two and one half days and for the others at three days. The squares containing these eggs were opened a short time before pupation was expected to take place. Thereafter they were examined daily and the dates of pupation, formation of the teneral adult, and emergence recorded. By these means the actual progress of the weevils from the egg to emergence was ascertained with considerable accuracy. Of the original 107 individuals, the larval period of 98, the pupal period of 50, and the postpupal or teneral adult and total periods of 58 were determined.

The results obtained indicate that the larval period occupies slightly less than one half of the total developmental period, and approximately equals the incubation and pupal periods combined. The larval period showed somewhat greater variation than the inactive periods, the excess being probably due to the drying of the opened squares, while the egg and pupal periods were influenced largely by the temperature. The variation of one to three days in the postpupal period can be explained only by the peculiarities of the individual weevils.

The average mean total developmental period of the weevils under observation was somewhat higher than of weevils from undisturbed squares infested during the same period, due to the more rapid drying of the opened squares. The average developmental period of the 92 weevils bred from unopened squares was 13.4 days, 0.4 of a day less than for those in the opened squares. The average mean developmental period as determined above taken together with the average preoviposition period, shown in Table IV, gives an average total life cycle, exclusive of the oviposition period of about twenty days. The minimum, however, as shown by the figures of these two sets of observations, may be as low as sixteen days.

The data on the total developmental period and its several divisions are shown in Table VI.

The developmental period for individual weevils throughout the season was taken as the time between the average date of oviposition and the average date of emergence. Since examinations were made only once in twenty-four hours, this gives a possible variation of two days, and, when one observation was omitted, of three days. Obtained

TABLE VI

SUMMARY OF TOTAL DEVELOPMENTAL PERIOD

Date of deposition of eggs	Number of individuals	Incubation period. Days	Date of hatching	Date of pupation	Number of individuals	Larval period. Days			Date of teneral adult	Number of individuals	Pupal period. Days			Date of emergence	Number of individuals	Teneral adult period. Days	Total period oviposition to emergence. Days		
						Max.	Min.	Mean			Max.	Min.	Mean				Max.	Min.	Mean
6.27-28	9	3	6.30-7.1	7.7-8	9	8	6	7											
6.29-30	5	3	7.2-3	7.8-9	5	7	5	6											
6.30-7.1	13	3	7.3-4	7.8-9	1	6	4	5	7.12	1	4	3	3.5	7.14	1	2	14	13	13.5
				7.9-11	9	8	5	6.5	7.13	5	4	2	3	7.14	4	1	14	13	13.5
														7.15	1	2	15	14	14.5
									7.14	2	5	3	4	7.15	1	1	15	14	14.5
														7.16	1	2	16	15	15.5
									7.15	1	6	4	5	7.16	1	1	16	15	15.5
7.1-2	40	3	7.4-5	7.10-11	18	7	5	6	7.14	4	4	3	3.5	7.15	3	1	14	13	13.5
														7.16	1	2	15	14	14.5
														7.16	5		15	14	14.5
				7.11-12	20	8	6	7	7.14	4	3	2	2.5	7.16	4	2	15	14	14.5
									7.15	2	4	3	3.5	7.16	2	1	15	14	14.5
														7.16	4		15	14	14.5
				7.12-13	2	9	7	8											
7.3-4	12	3	7.6-7	7.12-13	11	7	5	6	7.15	3	3	2	2.5	7.17	3	2	14	13	13.5
									7.16	6	4	3	3.5	7.17	2	1	14	13	13.5
														7.18	4	2	15	14	14.5
				7.13-14	1	8	6	7											
7.6-7	28	2.5	7.9-10	7.13-14	2	5.5	3.5	4.5	7.17	2	4	3	3.5	7.19	2	2	13	12	12.5
				7.14-15	15	6.5	4.5	5.5	7.18	15	4	3	3.5	7.19	5	1	13	12	12.5
														7.20	10	2	14	13	13.5
				7.15-16	4	7.5	5.5	6.5	7.18	1	3	2	2.5	7.21	1	3	15	14	14.5
									7.19	3	4	3	3.5	7.20	1	1	14	13	13.5
														7.21	2	2	15	14	14.5
				7.16-17	1	8.5	6.5	7.5	7.22	1	6	5	5.5						
Totals and averages	107	2.8			98	7.3	5.2	6.3		50	3.9	2.8	3.3		58	1.6	14.3	13.3	13.8

in this manner, the total period varied from eleven to nineteen days. The former is probably a somewhat shorter time than actually elapsed in any case, but the error was counterbalanced by the later weevils in the same lot of squares. In all probability, the earliest weevils from a lot of eggs deposited within twenty-four hours came from the earliest eggs and the latest from the latest eggs, so that, other things being equal, the developmental period of all the weevils from these eggs would be equal.

One of the principal factors in causing variation in the length of the developmental period within a given lot of squares and between different lots of squares during the progress of the work was the condition of the food supply. This factor was most troublesome and most difficult of control, especially in small lots of squares and late in the season.

The following table shows the variation in the length of the developmental period and the number of weevils requiring the different periods for development:

TABLE VII

Developmental period. Days	Number of weevils
11.0	6
12.0	118
12.5	16
13.0	342
13.5	14
14.0	178
14.5	10
15.0	79
15.5	2
16.0	62
16.5	1
17.0	29
18.0	8
18.5	1
19.0	1

Another factor which largely affected the development of the weevils was the temperature. In order to indicate as nearly as possible the effect of temperature on the length of the developmental period, the weighted average daily and periodic developmental periods were calculated for all of the weevils bred. The average daily period varied in duration from twelve to nineteen days, but, as each of these extremes include data on only one weevil each, the variation is more accurately shown by the thirty-three weevils emerged on August 7, which averaged 12.45 days, and the twenty emerged September 22 which averaged 16.67 days. The average period for the 868 weevils reared was 13.68 days.

For convenience in showing the effect of the temperature on the duration of the developmental period, the dates of emergence were divided as far as possible, into groups of ten days each and the weighted average

period determined for all weevils emerging between the extreme dates. For the first period, ten days ending July 17, the average period was 14.25 days; second period, ten days ending July 27, 13.9 days; third period, ten days ending August 6, 13.54 days; fourth period, ten days ending August 16, 12.92 days; fifth period, six days ending August 22, 13.48 days; sixth period, ten days ending September 11, 14.0 days; seventh period, ten days ending September 21, 15.31 days; and eighth period, eight days ending September 29, 15.97 days.

The weighted average daily, periodic, and seasonal developmental periods are shown in Table VIII.

TABLE VIII

WEIGHTED AVERAGE DAILY, PERIODIC, AND SEASONAL DEVELOPMENTAL PERIODS

Date of emergence	Number of weevils	Average developmental period	Average for period	Date of emergence	Number of weevils	Average developmental period	Average for period
July 8	6	14.17		Aug. 13	19	13.05	
" 9	8	14.50		" 14	8	12.88	
" 10	7	14.29		" 15	6	13.17	
" 11	11	15.14		" 16	3	13.00	12.92
" 14	7	13.29					
" 15	5	13.40		" 17	1	15.00	
" 16	21	14.38		" 18	3	13.00	
" 17	7	13.86	14.25	" 19	9	13.22	
				" 20	12	13.50	
" 18	16	12.88		" 21	16	13.56	
" 19	12	12.50		" 22	5	13.60	13.48
" 20	17	13.18					
" 21	54	12.94		Sept. 2	1	12.00	
" 22	47	12.96		" 5	2	13.50	
" 23	25	12.48		" 6	6	13.50	
" 24	25	13.16		" 7	9	13.44	
" 25	18	13.33		" 8	4	13.75	
" 26	15	13.27		" 9	5	14.80	
" 27	26	13.35	13.90	" 10	6	14.00	
				" 11	8	13.75	14.00
" 28	29	13.58					
" 29	14	14.00		" 12	7	14.14	
" 30	18	13.78		" 13	8	14.13	
" 31	29	14.69		" 14	1	14.50	
Aug. 1	8	13.25		" 15	8	14.75	
" 2	13	12.92		" 16	2	15.75	
" 3	23	13.17		" 17	7	14.86	
" 4	18	12.94		" 18	11	15.41	
" 5	22	13.14		" 20	17	16.09	
" 6	13	13.00	13.54	" 21	10	16.40	15.31
" 7	33	12.45		" 22	20	16.67	
" 8	13	13.15		" 23	15	15.00	
" 9	10	13.00		" 25	12	16.08	
" 10	11	12.82		" 26	5	16.20	
" 11	20	13.00		" 27	5	15.60	
" 12	14	13.43		" 29	1	17.00	15.97
				Oct. 4	1	19.00	
Total weevils and average for season.....					868	13.68	

The method of obtaining the average temperatures used to show the effect of this factor on the duration of the developmental period was as follows: all recorded maximum, minimum, and mean temperatures from the average date of oviposition to the average date of emergence

were added and the average struck. These average temperatures, together with the average developmental periods of the weevils reared during the different periods, and the number of weevils representing each period, are shown in Table IX. The relation between the temperature and the developmental period is shown in graphic form on the chart. This chart shows that the relation between the average periods and any of the temperature curves is most intimate with that of the minimum, the developmental curve going down as a rule when the minimum curve goes higher. The only exceptions to this rule are found in the first and fifth periods. These two periods were repre-

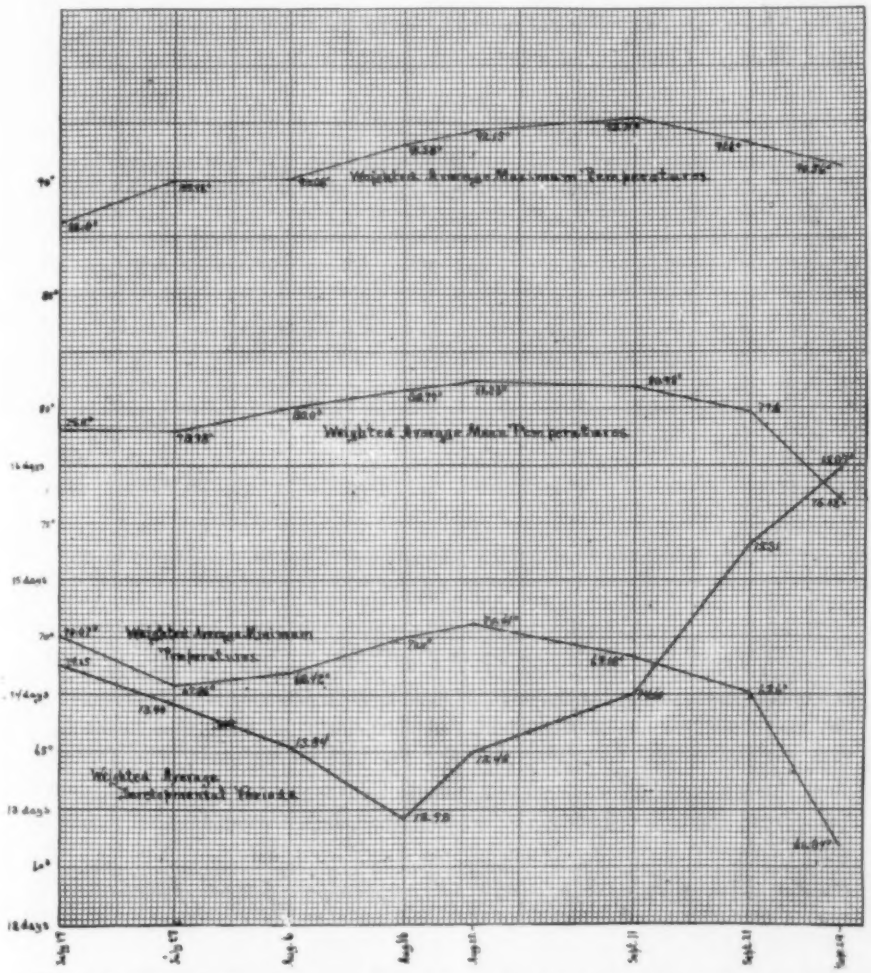

Weighted Average Maximum Temperatures
Weighted Average Mean Temperatures
Weighted Average Minimum Temperatures
Weighted Average Developmental Periods

Chart showing relation between temperature and developmental period of cotton boll weevil

sented by seventy-two and forty-six weevils respectively, bred from the earliest and latest eggs of the original hibernating weevils. The lots of squares from which they were reared were small and the factor of food condition had a large effect in retarding the development. In addition, the earliest period is represented by weevils reared before the best methods of keeping infested squares were found, and these weevils were therefore further retarded by this extra deleterious effect on their supply of food. The average developmental periods in the last three periods were also considerably increased from the normal by the poor condition of the squares used late in the season. These three periods were also represented by rather small numbers of weevils. Also, the sixth period is represented only by weevils reared from the earliest eggs of two lots of weevils and hence from small lots of squares.

TABLE IX

RELATION BETWEEN LENGTH OF DEVELOPMENT AND TEMPERATURE

Number of period	Number of weevils	Average developmental period	Average date of oviposition	Average date of emergence	Average temperatures		
					Min.	Mean	Max.
1	72	14.25	June 29	July 12	70.07	79.11	88.18
2	255	13.90	July 9	July 22	67.86	78.98	89.92
3	187	13.54	" 20	Aug. 1	68.42	80.00	90.08
4	137	12.92	" 30	" 11	70.00	80.79	91.58
5	46	13.48	Aug. 6	" 19	70.61	81.23	92.15
6	41	14.00	" 24	Sept. 6	69.18	80.98	92.71
7	71	15.31	Sept. 1	" 16	67.60	79.60	91.60
8	58	15.97	" 10	" 25	60.84	76.02	90.56

Comparative Duration of Developmental Period in Males and Females

Before the work had progressed very far it was noticed that, in general, a relative majority of the earliest weevils reared from the different lots of squares were females and that the percentage of males increased as time passed. A summary of the records in this respect shows the following: of the 86 lots of squares, the females had the shortest average development in forty, the males in twenty-two, from ten lots only females were reared, from seven lots only males, and in seven cases the developmental period for both sexes was the same. The weighted average developmental period for the 475 males reared was 13.88 and for the 393 females 13.49 days, a difference of 0.39 days.

A summary of the figures based on oviposition days is given in Table X.

TABLE X

COMPARATIVE LENGTH OF DEVELOPMENTAL PERIOD OF MALE AND FEMALE BOLL WEEVILS

(In last column the signs indicate the sex showing shorter period.)

Total number of weevils	Number of males	Average period. Days	Number of females	Average period. Days	Difference
49	22	13.27	27	13.15	♀0.12
43	21	13.29	22	12.59	♀0.70
38	24	13.67	14	13.43	♀0.24
35	17	12.41	18	12.28	♀0.13
33	16	12.94	17	12.69	♀0.25
32	19	14.05	13	14.38	♂0.33
27	15	13.00	12	12.33	♀0.67
24	15	12.73	9	13.22	♂0.49
23	14	13.79	9	14.00	♂0.21
22	10	13.20	12	13.33	♂0.13
21	11	13.45	10	12.80	♀0.65
21	14	16.14	7	15.71	♀0.43
20	11	14.27	19	13.29	♀0.96
19	9	13.89	10	13.80	♀0.09
19	9	12.33	10	13.10	♂0.77
19	10	13.20	9	13.00	♀0.20
18	9	12.72	9	13.17	♂0.45
17	9	14.67	8	13.25	♀1.42
17	5	13.80	12	12.83	♀0.97
16	13	13.38	3	13.33	♀0.05
16	7	13.43	9	13.00	♀0.43
16	10	13.70	6	12.83	♀0.87
16	9	13.55	7	13.43	♀0.12
15	9	12.79	6	13.00	♂0.21
15	10	16.50	5	16.60	♂0.10
14	10	15.10	4	14.00	♀1.10
14	9	16.11	5	16.00	♀0.11
13	8	13.88	5	13.90	♂0.02
13	7	13.86	6	13.83	♀0.03
13	8	15.12	5	13.10	♀2.02
12	9	13.33	3	13.67	♂0.34
11	7	15.29	4	15.25	♀0.04
11	3	14.33	8	14.00	♀0.33
11	8	12.62	3	12.00	♀0.62
11	6	13.67	5	13.40	♀0.27
11	9	13.33	2	13.50	♂0.17
11	8	15.50	3	15.67	♂0.17
11	7	15.43	4	15.75	♂0.32
9	5	13.40	4	13.50	♂0.10
9	6	16.50	3	16.00	♀0.50
7	4	14.75	3	14.67	♀0.08
6	5	15.20	1	16.00	♂0.80
6	4	13.50	2	13.50	.....
6	5	12.80	1	12.00	♀0.80
6	3	13.33	3	13.67	♂0.34
6	1	14.00	5	13.20	♀0.80
5	1	16.00	4	15.00	♀1.00
5	3	13.33	2	12.50	♀0.83
5	2	15.00	3	15.00	.....
5	2	17.00	3	17.33	♂0.33
4	2	12.50	2	13.00	♂0.50
4	2	14.00	2	14.00	.....
4	3	15.33	1	16.00	♂0.67
3	1	14.00	2	14.00	.....
3	3	14.00	.....	.....	.....
3	.....	.....	3	13.33	.....
3	3	15.67	.....	.....	.....
2	.....	.....	2	14.50	.....
2	1	17.00	1	15.00	♀2.00
1	.....	.....	1	17.00	.....
1	.....	.....	1	15.00	.....
1	.....	.....	1	13.00	.....
1	.....	.....	1	11.00	.....
1	.....	.....	1	12.00	.....
1	1	12.00	.....	.....	.....
1	.....	.....	1	14.00	.....
1	1	19.00	.....	.....	.....
868	475	13.88	393	13.49	♀0.39

Reference to this table shows that the shorter period for females occurred in squares infested on twenty-five out of the thirty-eight days when the lots of infested squares were large and more than ten weevils were reared, and the ratio for smaller lots was only seven out of thirteen in which the females showed the shorter period. Other things being equal, the larger the lot of squares, the better the condition for food and the shorter the developmental period of the weevils reared. It was in these larger lots that the predominance of females among the earliest weevils from a given day's squares was most noticeable.

THE COCCIDÆ OF LOUISIANA[1]

Second Paper

By T. C. Barber,

Agent and Expert, Audubon Park Laboratory, U. S. Bureau of Entomology

The following list of Coccidæ is the result of a rather extended search among the flora of Audubon Park, New Orleans, La., commenced more than a year ago, to ascertain what species of scale insects were the main source of food supply for the Argentine Ant, *Iridomyrmex humilis* Mayr. A preliminary list of the "Coccidæ of Audubon Park" was published in this Journal last year (Vol. III, No. 5, p. 420–425, 1910) and included 34 species, with the host plants upon which they were collected. Since this list appeared, a considerable number of additional species have been collected, and the writer concluded to add to his own collections all species previously collected in Louisiana of which he could find reliable record, with the intention of commencing a check list of the Coccidæ of the state.

That this list is not nearly complete is proven by the number of newly-recorded species which have been added to it within the past year. Close search through our scanty available literature has resulted in finding records of 35 species previous to 1910. The present list almost doubles this number, as it includes 65 species, all but 20 of which are represented in Audubon Park. However, it is obviously more complete than the records which were available previously.

In order to insure accuracy, all determinations of material collected by the writer have been made by the Bureau of Entomology at Washington, D. C., through the courtesy of Dr. L. O. Howard. The writer herewith expresses his deep indebtedness to Messrs. J. G.

[1]Published by permission of the Chief of the Bureau of Entomology.

Sanders and E. R. Sasscer for their unfailing kindness in determining the large amount of material submitted to them at various times.

In the case of newly-recorded species, the locality, collector's name or initials, and the host plants are given, as well as the initials of the gentleman who made the determination. For other species, the reader is referred to the brief chronological bibliography which will be found at the end of the list. A scientific name in parentheses, followed by a bibliographical number, indicates that the species was mentioned in the given article under the name given in parentheses. The general arrangement of species is on the system adopted by Mrs. Fernald in her "Catalogue of the Coccidæ of the World."

LIST OF COCCIDÆ COLLECTED IN LOUISIANA

SUBFAMILY CONCHASPINÆ.

1. *Conchaspis angræci* Ckll. (7)

SUBFAMILY DACTYLOPIINÆ.

2. *Asterolecanium bambusæ* Bd. Collected Audubon Park, New Orleans, and at Riverside, La., on Bamboo. T. C. B., Det. E. R. S.

3. *A. pustulans* Ckll. Collected in New Orleans by C. W. Flynn on Figs. Det. J. G. S.

4. *Lecaniodiaspis* sp. (7)

5. *Kermes galliformis* Riley. (5)

6. *K. pubescens* Bogue. (5).

7. *Pseudococcus calceolariæ* Mask. (6 & 7)

8. *P. citri* Risso. (1, 6 & 7)

9. *P.*, near *citri*. Collected on Willow at Baton Rouge, La., by G. A. Runner. Det. J. G. S. (4)

10. *P. longispinus* Targ. (*P. adonidum*, 7)

11. *P. solani* Ckll. Collected in Baton Rouge, La., by J. B. Garrett and the writer at different times. Det. J. G. S.

12. *P.* sp. (7)

13. *P.* sp. (7)

SUBFAMILY COCCINÆ.

14. *Pulvinaria acericola* W. & R. Collected Alexandria, La., by W. P. Smith. Det. J. G. S. (4)

15. *P. cupaniæ* Ckll. (7)

16. *P. vitis* Al. (7)

17. *Ceroplastes cirripediformis* Comst. (5 & 7)

18. *C. floridensis* Comst. (1 & 5.) Also collected in Audubon Park on *Robinia pseudacacia* and *Cedar deodorans*. T. C. B. Det. E. R. S.

19. *Eucalymnatus tessellatus* Ckll. (7)

20. *Coccus hesperidum* L. (*Lecanium hesperidum*, 1) (7)

21. *Neolecanium cornuparvum* Thro. (5 & 7)

22. *Toumeyella turgida* Ckll. Collected Audubon Park on *Magnolia grandiflora*, T. C. B. Det. J. G. S.

23. *Eulecanium corni* Bouche. (7)

24. E. *nigrofasciatum* Perg. (5) Also collected in Audubon Park on Willow, T. C. B. Det. E. R. S.

25. *E. quercifex* Fitch. Collected in Audubon Park on Oak. T. C. B. Det. E. R. S.
26. *E.* sp. (7)
27. *Saissetia hemisphærica* Targ. (7)
28. *S. oleæ* Bern. (7)

SUBFAMILY DIASPINÆ.

29. *Chionaspis americana* Johnson. Collected in Audubon Park on Hickory and Celtis. T. C. B. Det. E. R. S.
30. *C. citri* Comst. (1)
31. *C. longiloba* Cooley. Collected in Audubon Park on Cottonwood. T. C. B. Det. E. R. S.
32. *C. salicis-nigra* Walsh. Collected in Audubon Park on Willow. T. C. B. Det. E. R. S.
33. *Diaspis boisduvalis* Sign. (7)
34. *D. bromeliæ* Kern. (7)
35. *D. echinocacti cacti* Comst. (4) Collected in Gretna, La., by C. W. Flynn, on Cactus. Det. Wilmon Newell.
36. *Aulacaspis pentagona* Targ. (5)
37. *A. rosæ* Bouche. (2 & 5)
38. *Fiorinia fioriniæ* Targ. var. *camelliæ*. (2 & 5)
39. *Aspidiotus ancylus* Putn. (5)
40. *A. britannicus* Newst. (5)
41. *A. camelliæ* Sign. (7)
42. *A. forbesi* Johnson. (5)
43. *A. hederæ* Vall. (*A. nerii*, 1 & 2) (7)
44. *A. juglans regiæ* Comst. (2 & 5)
45. *A. lantaniæ* Sign. (4 & 7)
46. *A. ostreæformis* Curt. (5)
47. *A. perniciosus* Comst. (5 & 7)
48. *A. rapax* Comst. (2)
49. *Cryptophyllaspis liquidambaris* Kot. (7)
50. *Chrysomphalus aonidum* Linn. (*Aspidiotus ficus*, 1 *C. ficus*, 5 & 7)
51. *C. aurantii* Mask. Collected in Audubon Park on *Podocarpus japonica*. T. C. B. Det. E. R. S.
52. *C. dictyospermi* Morg. (4 & 7)
53. *C. obscurus* Comst. (5, 6 & 7)
54. *C. sphærioides* Ckll. (3)
55. *C. tenebricosus* Comst. (5)
56. *Odonaspis inusitata* Green. (7)
57. *O. secreta* Ckll. Collected in Audubon Park on Bamboo. T. C. B. Det. E. R. S.
58. *O.* sp. (7)
59. *Lepidosaphes beckii* Newm. (*Mytilaspis citricola*, 1 & 2.) (*L. beckii*, 5 & 7)
60. *L. gloveri* Pack. (*Mytilaspis gloveri* 1 & 2.) (*L. gloveri*, 5 & 7)
61. *Ischnaspis longirostris* Sign. (7)
62. *Parlatoria pergandei* Comst. (2, 5 & 7)
63. *P. proteus* Curt. (5 & 7)

NOTE:—Since the above was written, the following additional species have been collected in Audubon Park by the writer, and have been determined by Mr. E. R. Sasscer.

64. *Eriococcus quercus* Comst. On oak.
65. *Eulecanium caryæ* Fitch. On oak.

Kermes galliformis Riley was also collected upon live oak, making a total of 49 species collected to date in Audubon Park.

BIBLIOGRAPHY

1. 1893.—The Orange and Other Citrus Fruits.—W. C. Stubbs and H. A. Morgan, Special Bulletin, La. Exp. Station, Baton Rouge, La.

2. 1894.—Report of the Entomologist, 1893–94.—H. A. Morgan, Bul. 28, La. Exp. Station, Baton Rouge, La.

3. 1903.—The Coccidæ of the World.—Mrs. Maria E. Fernald, Press of Carpenter & Moorehouse, Amherst, Mass.

4. 1903–1908.—Accessions catalogue, La. State Crop Pest Commission, Baton Rouge, La.

5. 1908.—A Brief Summary of the More Important Injurious Insects of Louisiana.—Wilmon Newell & Arthur H. Rosenfeld. Journ. Ec. Ent., Vol. I, No. 2, p. 150–155.

6. 1910.—Insects Notably Injurious in Louisiana during 1908 and 1909.—Arthur H. Rosenfield, Journ. Ec. Ent., Vol. III, No. 2, p. 212–217.

7. 1910.—Coccidæ of Audubon Park, New Orleans, La.—T. C. Barber, Journ. Ec. Ent., Vol. III, No. 5, p. 420–425.

HOSTS AND GALLS OF AMERICAN GALL MIDGES

By E. P. Felt, *Albany, N. Y.*

The following list summarizes our knowledge concerning the food habits of the American gall midges or Itonidæ (including certain St. Vincent and other South American forms studied by the writer) and, in connection with the description of species, has proved of great help in determining many representatives of our rich and varied fauna. This list should also prove of service in indicating the more profitable lines for future life history and ecological studies in this group. It will be noted that our knowledge of the midges occurring upon certain plants is much more extensive than that in relation to others. A portion of this discrepancy is evidently due to marked preferences on the part of the insects, while in not a few cases it may be attributed to a lack of study. This is particularly true of the root-inhabiting forms. Potentially, there should be at least one, and frequently several species living at the expense of most of our native plants, while European forms may be introduced from time to time and become well established upon their natural hosts in this country.

This list gives the correct generic reference for the reared species so far as possible. The old generic name of Cecidomyia, with its varied interpretations by earlier writers, is used in this list as a designation for a biological group and applied to species we are unable to refer to any of the more closely defined, modern genera.

ABIES BALSAMEA (balsam)

Subglobular basal swellings of leaves, length 3 mm. . . *Cecidomyia balsamicola* Lintn.

ABIES (spruce)

Seeds destroyed, the cone not deformed.....*Dasyneura canadensis* Felt.

ACALYPHA VIRGINICA (3-spotted mercury)

Subglobular, reddish bud gall, diameter 4 mm.....*Cecidomyia* sp.

ACER (maple)

Rolled leaf margin, edges yellow, center crimson.....*Cecidomyia* sp.

ACER NEGUNDO (box elder)

Terminal bud galls, diameter 1 to 2 cm.....*Cecidomyia negundinis* Gill.
Variable, subglobose leaf gall, diameter about 2 mm...*Contarinia negundifolia* Felt.

ACER RUBRUM (red maple)

Under decaying bark.....*Miastor americana* Felt.
Lestodiplosis sp.
Ocellate, yellow, red margined gall, diameter 5–6 mm...*Cecidomyia ocellaris* O. S.
Distorted, rolled leaves bearing white cocoons.....*Dasyneura* sp.
Lestodiplosis sp.
Irregular leaf folds.....*Rhabdophaga rileyana* Felt.
Pouch vein galls, reddish, length 6 mm.....*Dasyneura communis* n. sp.

ACER SACCHARINUM (white or silver maple)

Free larvæ on irregularly curled leaves.....*Cecidomyia aceris* Shim.

ACHILLEA MILLEFOLIUM (Yarrow)

Florets infested.....*Clinorhyncha millefolii* Wachtl.

ACTINOMERIS ALTERNIFOLIA

Globose bud galls.....*Cecidomyia verbesinæ* Beutm.

AGRIMONIA (Agrimony)

Reared from florets.....*Contarinia agrimoniæ* Felt.

AGROPYRON (quack)

Under leaf sheath.....*Phytophaga destructor* Say.

AGROSTIS ALBA (red top)

Ovipositing on.....*Dasyneura graminis* Felt.

ALNUS (alder)

Subconical bud gall, diameter 6 to 12 mm.....*Dasyneura serrulatæ* O. S.

ALOPECURUS PRATENSIS (fox-tail grass)

Reared from seeds.....*Itonida setariæ* Felt.

AMBROSIA (ragweed)

Reared from stems of giant ragweed.....*Neolasioptera ambrosiæ* Felt.

AMELANCHIER (shadbush)

Truncate leaf gall, greenish, tapering, red-lipped, length 5 mm.
Hormomyia canadensis Felt.
Oval, woolly, vein gall, yellowish or white, length 1 to 1.5 cm.
Itonida canadensis n. sp.
Flattened, white pouch gall on leaf margin, denticulate, length 3 to 4 mm.
Cecidomyia sp.
Leaf fold containing white larvæ ..... *Cecidomyia* sp.

AMPHICARPA MONOICA (hog peanut)

Oval stem gall, length, 1.5 cm. diameter, 1 cm. ..... *Lasioptera* sp.

AMSINCKIA LYCOPSOIDES

Undescribed, presumably bud gall ..... *Schizomyia macrofila* Felt.

ANEMONE CANADENSIS

Slightly enlarged, loose bud gall ..... *Dasyneura anemone* Felt.

ANTENNARIA (everlasting)

Corm-shaped bud gall, leaflets recurved, length, 8 to 12 mm.
Asphondylia antennariæ Whlr.
Elongate, oval bud gall, leaflets scarcely recurved, length 3 to 5 mm.
Rhopalomyia antennariæ Whlr.
White, wooly masses, snow-white fibers, 5 mm. long, radiating from hard, thin shelled cells presumably on Antennaria ..... *Rhopalomyia pilosa* Felt.

ANTHEMIS (Mayweed)

Larvæ in flower heads ..... *Cecidomyia* sp.

APOCYNUM (spreading dogbane)

Reared from slightly enlarged flower buds ..... *Itonida apocyni* Felt.
Reared from unopened flower buds ..... *Lestodiplosis apocynifloræ* Felt.

ARCTIUM (burdock)

Yellowish larvæ in burs ..... *Cecidomyia* sp.

ARISTOLOCHIA (Dutchman's pipe)

Ovate leaf galls ..... *Cecidomyia hageni* Aldr.

ARTEMISIA (wormwood)

Bud galls, presumably ..... *Asphondylia artemisiæ* Felt.
Flower galls or fusiform bud galls, length 4 mm. ..... *Rhopalomyia betheliana* Ckll.
Deformed flower heads, length 10 mm., diameter 5 to 6 mm.
Rhopalomyia coloradella Ckll.
Globular, woolly galls, diameter about 1 cm. ..... *Rhopalomyia alticola* Ckll.

ARTEMISIA TRIDENTATA (sage bush)

Subglobular, brown, spongy apical gall, diameter 1.8 cm. ..... *Cecidomyia* sp.
Probably stem gall ..... *Diarthronomyia artemisiæ* Felt.
Oval, bud-like, flower gall the size of a pea ..... *Rhopalomyia tridentatæ* Rubs.

ARTEMISIA GNAPHALODES

Irregular, lobulate, polythalamous, white, pubescent gall, diameter 1 cm.
Rhopalomyia gnaphalodis n. sp.

ASCLEPIAS (milkweed)

Elongate, fusiform stem gall on *A. incarnata*.....*Neolasioptera asclepiæ* Felt.
Rusty brown, irregularly swollen young leaves on *A. incarnata*.....*Cecidomyia* sp.
Oval, mid rib, tumid fold, length 7 mm. dia. 4 mm. on *A. incarnata*..*Cecidomyia* sp.
Reared from rolled leaf, *A. syriaca*.....*Lestodiplosis asclepiæ* Felt.

ASTER

Flower or Bud Galls

Aborted flower head of *Aster patens*.....*Asphondylia monacha* O. S.
Dwarfed or stunted flower heads of *Aster paniculatus*..*Rhopalomyia asterifloræ* Felt.
Axillary bud galls of *Aster lateriflorus*, diameter, 10 mm..*Rhopalomyia lateriflori* Felt.

Blister Leaf Galls

Gall, yellowish white, nearly circular, 2 to 3 mm. in diameter; on *Aster macrophyllus*.
Lasioptera clarkei Felt.
Gall, yellowish brown, narrowly oval, length, 4 mm.; diameter, 2 mm.
Asteromyia dumosæ Felt.
Gall, brownish, yellow ringed, circular, diameter, 3 mm.....*Asteromyia waldorfi* Felt.
Gall, yellowish, shining, oval, diameter, 6 to 7 mm.....*Asteromyia nitida* Felt.
Gall, pinkish, large, oval blotches on *Aster divaricatus*, diameter 10 to 12 mm.
Asteromyia divaricata Felt.
Gall, yellowish or brownish, irregularly oval, diameter 3 mm.
Asteromyia marginata Felt.
Gall, yellowish or brownish, irregularly oval, diameter 6 mm.; on *Aster paniculata*.
Asteromyia paniculata Felt.
Gall, blackish, oval, diameter 4 mm.....*Asteromyia reducta* n. sp.
Gall, greenish yellow or papery white, diameter 1.75 cm.; on *Aster lævis*
Asteromyia lævigana Felt.
Gall, sooty yellow beneath, dirty white above, length, 2 cm.; diameter, 1.2 cm.
Asteromyia flavomaculata Felt.
Gall, yellowish white, dark margined, diameter, 3.0 mm *Asteromyia asterifolia* Beutm.
Gall, oval, green swellings, length 2 mm., diameter, 1.5 mm.
Asteromyia vesiculosa Felt.

Stem or Branch Galls

Gall, a small pustulate swelling on aster stems, diameter 3 mm.
Asteromyia pustulata Felt.
Fusiform stem or branch gall, length, 1 cm.; diameter 0.4 cm.
Neolasioptera ramuscula Beutm.
Greenish brown, fusiform, irregular stem swelling at or near the base of the leaf, length, 1 cm; diameter, 0.6 cm., on *Aster infirmus*... *Neolasioptera albitarsis* Felt.
Oval twig gall on *Aster novæ-angliæ*.....*Rhopalomyia astericaulis* Felt.
Ovate, sessile, brownish galls densely white haired, length, 7 mm., on *Aster crassulus*.
Rhopalomyia crassulina Ckll.

ATRIPLEX CANESCENS

Irregular stem gall, length, 12 mm.; diameter, 4.5 to 6 mm.
Asphondylia atriplicis Ckll.
Irregularly subglobular with sparse, long hairs, diameter, 8 to 9 mm.
Asphondylia neomexicana Ckll.
Irregular twig gall, length, 1.5 mm.; diameter, 5 mm..... *Lasioptera willistoni* Ckll.
A circular, pustular leaf gall, diameter, 2.5 mm..... *Cecidomyia atriplicicola* Ckll.

AUDIBERTIA STACHYOIDES

Irregular, subspheric gall..... *Rhopalomyia audibertiæ* Felt.

AVENA (oat)

Reared from cage with aphid-infested seedlings, probably zoöphagous
Coquillettomyia texana Felt.
Reared from oats, possible fungivorous..... *Mycodiplosis spinosa* n. sp.
Reared from cage sown with oats..... *Prionellus monilis* Felt.

BACCHARIS PILULARIS

Flower gall..... *Rhopalomyia californica* Felt.
Lobulate bud gall..... *Rhopalomyia* sp.
Stem gall..... *Rhopalomyia baccharis* Felt.

BENZOIN (spice bush)

Young leaves with margins rolled..... *Cecidomyia* sp.
Irregular subcortical gall, length, 2 to 0.5 cm..... *Lasioptera linderæ* Beutm.

BETULA (birch)

Under decaying bark..... *Miastor americana* Felt.
Lestodiplosis sp.
Reared from seeds..... *Oligotrophus betulæ* Winn.

BIGELOWIA (rayless goldenrod)

A small, bud-like gall on *B. graveolens*..... *Cecidomyia brassicoides* Town.
Cone-like, probably bud gall on *B. graveolens*..... *Dasyneura strobiloides* Town.
Oval seed gall..... *Rhopalomyia bigelovioides* Felt.
Hollow stem gall..... *Rhopalomyia bigeloviæ* Ckll.

BOEHMERIA (false nettle)

Fusiform stem gall, length, 12 mm.; diameter, 6 mm.... *Cecidomyia bœhmeriæ* Beutm.

BUMELIA (false buckthorn)

Probably bud galls on *B. lanuginosa*..... *Asphondylia bumeliæ* Felt.

BUXUS (box)

Oval, yellowish or brownish blister-leaf gall..... *Monarthropalpus buxi* Lab.

CARPINUS (hornbeam, ironwood)

Reddish leaf fold along lateral veins..... *Cecidomyia pudibunda* O. S.

CARYA (hickory)

Under decaying bark.....*Miastor americana* Felt.
Under dying, sappy bark.....*Cecidomyia* sp.

Leaf Galls

Blister galls.—Irregular, dull greenish or black-margined and with a small nipple, diameter, 3 mm.....*Cecidomyia* sp.

Cylindric galls.—Greenish or black, 4 to 5 mm. long, 1 mm. in diameter.
Caryomyia tubicola O. S.

Conical galls.—Base subglobular with a long, slender apical process, greenish to reddish brown, 3 to 4 mm. long. Occurs in groups on midrib of bitternut hickory.....*Caryomyia caryæcola* O.S.

Conical, nearly symmetrical, thin-walled, small, green or red tinted, length, 2 mm.....*Caryomyia sanguinolenta* O. S.

Narrowly conical, light green midrib or vein gall, length, 5 mm., diameter, 1 mm.....*Caryomyia* sp.

Globose galls.—Smooth or nearly so.

Nearly smooth, thin-walled yellowish green or brown, sparsely haired, usually with a slight nipple, diameter, 2 mm.....*Caryomyia caryæ* O. S.

From same gall, probably inquiline.....*Cecidomyia caryæ* O. S.

Slightly pubescent, thick-walled, depressed, yellowish green or brown, diameter, 2 to 2.5 mm.....*Caryomyia consobrina* Felt.[1]

Thin-walled, probably similar to the above.....*Caryomyia arcuaria* Felt.

Thin-walled without the nipple of *Caryomyia caryæ*, with a yellowish pubescence, diameter, 2 to 4 mm.....*Caryomyia similis* Felt.

Thin-walled, globose, slightly depressed, with a slight nipple, diameter, 3 to 4 mm.....*Cecidomyia* sp.

Thick-walled, yellowish green or brown, diameter, 4 to 5 mm.
Caryomyia antennata Felt.

Thick-walled, irregularly ovate, granulate, a slight nipple, diameter, 2 to 3 mm.
Cecidomyia sp.

Thin-walled with a false chamber at the apex, diameter, 2 to 3 mm.
Caryomyia inanis Felt.

Globose galls.—Hairy.

Thick-walled, brown or reddish brown, hairs rather short, curly, thick, diameter, 6 to 7 mm.....*Caryomyia persicoides* Beutm.

Similar to the above and other Caryomyia galls, probably inquiline
Clinodiplosis caryæ Felt.[2]

Thin-walled, rust red, hairs rather long, straight, diameter, 2 to 4 mm.
Caryomyia holotricha O. S.

Gall, similar to the above, the midge probably inquiline
Mycodiplosis holotricha Felt.

Thin-walled, long haired, melon-shaped, diameter, 2 to 3 mm.
Caryomyia thompsoni Felt.

Thin-walled, long, thick, brown hair, globose, diameter, 3 to 4 mm.; nipple distinct, long on some.....*Caryomyia* sp.

---

[1] *Schizomyia caryæcola* Felt was supposed to have been reared from this gall. The one or two specimens obtained were probably accidental.

[2] This species was apparently reared from the gall of *Caryomia inanis* and that of *C. persicoides*, probably *inquiline*.

Midrib gall.—A rounded, irregular, pale yellowish, hard swelling, 12 mm. long.
Caryomyia cynipsea[1] O. S.

Forming no gall.—An irregular, yellowish brown margined elevation; diameter, 3 mm. Larva attached by a viscid secretion..... *Caryomyia glutinosa*[1] O. S.

Swellings in Husks

Irregular swelling in the husks produced by pale reddish larvæ.
Caryomyia nucicola[1] O. S.

CASSIA (wild sensitive plant)

Irregular stem gall, length, 3 cm; diameter, 5 or 6 mm..... *Lasioptera cassiæ* Felt.

CASSAVA (Manihot)

Leaf galls..... *Itonida manihot* Felt.

CASTANEA (chestnut)

Under decaying bark and wood..... *Miastor americana* Felt.
Winnertzia pectinata, n. sp.
Itonida pugionis n. sp.
Petiole or terminal bud gall..... *Rhopalomyia castaneæ* Felt.

CASTANEA PUMILA (Chinquapin)

Irregular swelling of bur..... *Cecidomyia chinquapin* Beutm.

CATALPA

Reared from dwarfed shoots and pods..... *Itonida catalpæ* Comst.

CATTLEYA GIGAS

Reared from roots..... *Clinodiplosis cattleyæ* Felt.

CEANOTHUS

Loose terminal bud gall, length, 2 cm.; diameter, 1.5 cm.
Asphondylia ceanothi Felt.

CELASTRUS (climbing bittersweet)

Irregular, cortical gall on root, length, 2.5 cm.; diameter, 1 cm.
Cecidomyia celastri Steb.

Subcortical stem gall probably identical.

CELTIS (hackberry)

Galls on tender twigs, resembling seed capsule of Rumex, length, 4.5 mm.
Cecidomyia sp. (*semenrumicis* Patt.)
Conical or subglobular, arising from a circular, truncate base, diameter, 3.4 mm.; on tender twigs..... *Cecidomyia* sp. (*oviformis* Patt.)
Hollow, elongate twig swellings, length, 1.25 to 2.5 cm... *Cecidomyia* sp. (*deserta* Patt.)
A hard, obconic gall on upper side of leaf..... *Phytophaga celtiphyllia* Felt.
Subconical, clustered on the under side of the leaves, length, 3 to 5 mm.
Cecidomyia unguicula Beutm.

[1] The reference of this larva to Caryomyia is provisional only.

Rosette-shaped gall, resembling the seed capsule of Hibiscus, diameter, 2 to 3 mm. on under side of leaf.....*Cecidomyia* sp. (*capsularis* Patt.)
Yellowish, disk-shaped gall with acute apical cone on leaf...*Cecidomyia lituus* Walsh.
Leaf gall resembling that of *Pachypsylla celtidis-pubescens*, diameter, 3.5 to 4 mm. *Cecidomyia* sp. (*pubescens* Patt.)
Stout, conical, arising from a circular base, yellowish, diameter, 2.8 mm. *Cecidomyia* sp. (*spiniformis* Patt.)

CEPHALANTHUS (button bush)

Twig gall.....*Rhabdophaga cephalanthi* Felt.

CHRYSOPSIS (golden aster)

Woolly, polythalamous bud gall, diameter, 1.5 cm...*Rhopalomyia chrysopsidis* Loew.

CICUTA (water hemlock)

White larva, probably on leaves.....*Cecidomyia* sp.

CIRSIUM (Canada thistle)

Reared from flower heads.....*Dasyneura gibsoni* n. sp.

CITHAREXYLUM

Reared from flowers.....*Asphondylia pattersoni* Felt.

CLEMATIS (virgin's bower)

Ovate, reddish brown, axillary gall, diameter, 4 mm...*Neolasioptera clematidis* Felt.
Iregular, subglobular bud gall, diameter, 1 cm.....*Dasyneura clematidis* Felt.
Irregular, subglobular bud gall, diameter, 1 cm.....*Contarinia clematidis* Felt.
Enlarged, reddened flower buds.....*Prodiplosis floricola* Felt.
Unopened, apparently normal flowers.....*Lestodiplosis clematiflorœ* Felt.

CLERODENDRON ACULEATUM (wild coffee)

Flower bud gall.....*Asphondylia attenuatata* Felt.

COFFEA (Liberean coffee tree)

Reared from fruits.....*Hyperdiplosis coffeœ* Felt.

COLLINSONIA (horse balm)

Subglobular, pubescent leaf gall, length, 4 to 7 mm. *Cecidomyia collinsoniæ* Beutm.
Narrow midrib or vein swelling.....*Cecidomyia collinsonifolia* Beutm.

CONVOLVULUS SEPIUM (hedge bindweed)

Fusiform stem gall, monothalamous, length, 1.5 cm.....*Lasioptera convolvuli* Felt.

CORNUS (dogwood)

Irregular, subcortical gall, length, 1 to 2 cm.; on *C. stolonifera* *Neolasioptera cornicola* Beutm.
Clavate twig gall, length, 1 to 2 cm.; on *C. florida*....*Lasioptera clavula* Beutm.
Yellowish, purple margined, blister leaf gall, diameter, 2 to 3 mm.; on *C. stolonifera*. *Lasioptera corni* Felt.
Tubular, curved, green gall, length, 8 mm.; on leaf of *C. amomum*. *Cecidomyia* sp. (*tuba* Steb.)

CORYLUS (hazel nut)

Hairy leaf fold.....*Lasiopteryx coryli* Felt.
Reared from same gall.....*Mycodiplosis corylifolia* Felt.
Sterile catkins deformed basally, swollen.....*Cecidomyia* sp. (*squamulicola* Steb.

CRATÆGUS (white thorn)

Reddish brown or green, blister leaf mine, diameter, 8 mm.
Lasioptera excavata Felt.
Reared from the same gall.....*Rhizomyia hirta* n. sp.
Cylindric, green, fimbriate, unicellular leaf gall, length, 4 to 5 mm.; height, 1.5 mm.
Rhizomyia absobrina Felt.
Reared from same gall.....*Lestodiplosis cratægifolia* Felt.
Stout, cup-shaped, fimbriate, unicellular leaf gall.....*Winnertzia hudsonici* Felt.
Cockscomb leaf gall, green and red, length, 1 cm....*Hormomyia cratægifolia* Felt.
Filamentous, subglobular vein gall, length, 1 cm.....*Cecidomyia bedeguar* Walsh.
Oval, fleshy vein gall, length, 5 to 8 mm.....*Cecidomyia* sp. (*venæ* Steb.)
Marginal leaf roll.....*Lestodiplosis florida* Felt.

CROTALARIA (rattle box)

Fusiform stem swelling.....*Cecidomyia* sp. (*crotalariæ* Steb.)

CUCUMERIS (melon)

Reared from curled tips.....*Contarinia setigera* Lintn.

CUCURBITA (squash)

Reared from rough squash.....*Mycodiplosis cucurbitæ* n. sp.
Reared from rough squash.....*Itonida cucurbitæ* n. sp.

DANTHONIA (wild oat grass)

Probably a stem gall.....*Lasioptera danthoniæ* Felt.

DESMODIUM (tick trefoil)

Bud gall, probably loose.....*Cecidomyia meibomiifoliæ* Beutm.
Elongate, fusiform, clustered bud gall, length, 8 to 22 mm.
Cecidomyia meibomiæ Beutm.
Irregular stem gall, length, 1.8 cm.....*Lasioptera desmodii* Felt.
Polythalamous stem gall, length, 2 cm.....*Neolasioptera hamata* Felt.

DIERVILLA (bush honeysuckle)

Green bud gall or enlarged fruit, length, 4 to 5 mm...*Asphondylia diervillæ* Felt.
Reared from apparently normal stem, diameter, 3 to 4 mm.
Lasioptera caulicola Felt.

DISCOREA (Yam)

Irregular, warty stem gall.....*Cecidomyia* sp.

ELYMUS AMERICANUS (wild rye)

Probably from stem gall.....*Rhabdophaga elymi* Felt.
Stem gall.....*Phytophaga destructor* Say.

EPHEDRA TRIFURCA

Irregular, subcortical, resinous gall.....*Lasioptera ephedricola* Ckll.
Fusiform twig gall, length, 12 mm.....*Lasioptera ephedræ* Ckll.

ERAGROSTIS MINOR

Probably a stem gall ..... *Neolasioptera agrostis* n. sp.

ERIGERON CANADENSIS (horseweed)

Reared from minute bud galls usually and also from a scarcely discolored, inconspicuous, blister mine ..... *Asteromyia modesta* Felt.
Fusiform stem gall ..... *Neolasioptera erigerontis* Felt.

ERIOGONUM

Elongate bud swelling ..... *Cecidomyia* sp.

EUPATORIUM

Green conical leaf galls, length, 4 mm.; diameter, 1.5 mm.
Hyperdiplosis eupatorii Felt.

EUPATORIUM PERFOLIATUM (thoroughwort, boneset)

Reared from apparently normal florets ..... *Clinorhyncha eupatoriflorœ* Felt.
Reared from florets ..... *Contarinia perfoliata* Felt.
Oval stem gall, length, 1 to 1.5 cm. ..... *Neolasioptera perfoliata* Felt.
Reared from apparently the same gall ..... *Brachyneura eupatorii* Felt.

EUPATORIUM PURPUREUM (Joe-pyeweed, trumpetweed)

Oval, blossom bud gall, length, 1 cm. ..... *Dasyneura purpurea* Felt.

EUPATORIUM URTICÆFOLIUM (white snake root)

Globose, flower, bud galls, length, 6 mm. ..... *Lestodiplosis eupatorii* Felt.
Subglobular stem gall, length, 1.5 cm. ..... *Neolasioptera eupatorii* Felt.
Similar gall ..... *Asphondylia eupatorii* n. sp.

EUPHORBIA (spurge)

Subcylindric fruit gall, length, 5 mm.; diameter, 1 mm. ..... *Cecidomyia* sp.

EUROTIA

Irregular bud galls ..... *Cecidomyia* sp.

FAGUS (beech)

Under decaying bark ..... *Miastor americana* Felt.

FICUS (wild fig)

Reared from a decaying branch ..... *Holoneurus occidentalis* Felt.
Lasiopteryx schwarzi Felt.
Hyperdiplosis americana Felt.

FRAGARIA (strawberry)

Reniform petiole gall, length, 8 to 21 mm. ..... *Cecidomyia* sp. (*reniformis* Steb.)

FRAXINUS (ash)

Subglobular leaf galls, diameter, 5 mm. ..... *Lasioptera fraxinifolia* Felt.
Same gall as above ..... *Cecidomyia pellex* O. S.
Apparently from the same gall ..... *Colpodia temeritatis* Felt.
Large, tumid, midrib gall, length 5 to 15 mm. ..... *Contarinia canadensis* Felt.
Same gall as above ..... *Dasyneura tumidosæ* Felt.

Base of leaf petioles ..... *Phytophaga fraxini* Felt.
Badly rolled leaves ..... *Lestodiplosis fraxinifolia* Felt.
Badly rolled leaves ..... *Rhizomyia fraxinifolia* Felt.
Tightly rolled leaves ..... *Dasyneura fraxinifolia* Felt.
Deformed terminal leafy head ..... *Dasyneura apicatus* Felt.

FUNGI

Fungus on rotting plum ..... *Hyperdiplosis fungicola* n. sp.
Unknown fungus ..... *Arthrocnodax macrofila* Felt.
Æcidiospores of Urocymes ..... *Toxomyia rubida* Felt.
Teleutospores of Puccinia ..... *Toxomyia fungicola* Felt.
Young mushrooms ..... *Mycophila fungicola* Felt.
Reared from *Œcidium impatientis* ..... *Mycodiplosis impatientis* Felt.
Larvæ on *Œcidium importatum* affecting Peltandra ..... *Mycodiplosis* sp.
Fungous affected wood ..... *Lasiopteryx flavotibialis* Felt.
Fungous affected heartwood of pine ..... *Monardia lignivora* Felt.

GALIUM (bedstraw)

Aborted flower buds, diameter, 3 mm ..... *Dasyneura galii* Felt.

GALEOPSIS (hemp nettle)

Irregular stem gall, length, 0.5 to 2 cm ..... *Lasioptera galeopsidis* Felt.

GARRYA FREMONTII

Suboval, black, irregular bud gall ..... *Asphondylia* sp.

GENISTA (woad-waxen)

Folded apical leaflets ..... (?) *Dasyneura genistamtorquens* Kieff.

GERANIUM (cranesbill)

Colorless larvæ on blister enlargement, apparently fungivorous ... *Cecidomyia* sp.

GERADIA FLAVA (downy false fox-glove)

Larvæ in seed pods ..... *Cecidomyia* sp.

GLEDITSIA (honey locust)

Orange larvæ in folded leaflets ..... *Dasyneura gleditschiæ* O. S.
Twig gall undescribed ..... *Neolasioptera* sp.

GOSSYPIUM (cotton)

Reared from flower buds ..... *Contarinia gossypii* Felt.

GRAMINEÆ (grass)

Reared from grass ..... *Neolasioptera squamosa* n. sp.

GUTIERREZIA SAROTHRÆ

Oval flower bud gall, length, 7 mm ..... *Rhopalomyia gutierreziæ* Ckll.

HAMAMELIS (witch-hazel)

Greenish blister leaf gall ..... *Asteromyia nigrina* n. sp.
Purplish, blister leaf galls, diameter, 5 mm ..... *Cecidomyia* sp.
Fleshy vein folds, length, 2 cm ..... *Cecidomyia* sp.
Purplish, corrugated folds between veins ..... *Cecidomyia* sp.

HELENIUM (sneeze weed)

Apical rosette gall, length, 2 to 3 cm. ..... *Asphondylia autumnalis* Beutm.

HELIANTHUS (sunflower)

Sunflower seeds apparently normal ..... *Lasioptera murtfeldtiana* Felt.
Twig gall, undescribed ..... *Asphondylia conspicua* O. S.
Globular or spherical stem galls, diameter, 1 to 4 cm. ..... *Asphondylia globulus* O. S.
Stem gall, undescribed ..... *Neolasioptera trimera* n. sp.
Stem gall on *H. divaricata* ..... *Cecidomyia thurstoni* Brodie.
Fusiform stem gall, length, 3 mm. ..... *Lasioptera weldi* Felt.
Subglobular leaf gall ..... *Cecidomyia bulla* Walsh.

HELIANTHUS STRUMOSUS

Flower heads apparently unmodified ..... *Asphondylia helianthiflorae* Felt.
Reared from undetected gall ..... *Neolasioptera helianthi* Felt.
Axillary bud gall, length, 10 to 25 mm ..... *Cecidomyia helianthi* Brodie.

HIBISCUS MOSCHEUTOS (swamp rose mallow)

Variably swollen stems ..... *Neolasioptera hibisci* Felt.

HORDEUM (barley)

Under leaf sheaths ..... *Phytophaga destructor* Say.

HUMULUS (hop)

Swollen stems, diameter, 1 cm.; length, 4 to 50 cm. ..... *Lasioptera humulicaulis* Felt.

HYDRANGEA ARBORESCENS (wild Hydrangea)

Bud gall, length, 1 cm ..... *Asphondylia hydrangeae* Felt.

HYPERICUM (St. Johnswort)

Axillary bud galls, length, 5 mm.; on *H. mutilum* ..... *Dasyneura toweri* Felt.
Subglobose stem gall, length, 1 cm ..... *Lasioptera virginica* n. sp.
Globular stalk swellings, length, 6 to 10 mm. ..... *Cecidomyia triadenii* Beutm.

IMPATIENS (balsam, jewelweed)

Globose, flower bud gall, length, 1 cm ..... *Cecidomyia impatientis* O. S.
Tumid midrib fold, length, 5 mm. ..... *Lasioptera impatientifolia* Felt.
Subglobular stem gall ..... *Lasioptera fulva* Beutm.

IPOMOEA (morning glory)

Flower buds ..... *Schizomyia ipomaeae* Felt.
Flower buds ..... *Camptoneuromyia meridionalis* Felt.

JUGLANS CINEREA (butternut, white walnut)

Folded, appressed, crinkled leaves ..... *Cecidomyia* sp.

JUNIPERUS CALIFORNICA (Juniper)

Reared from fruit ..... *Walshomyia juniperina* Felt.

JUSSIAEA

Reared from fruits ..... *Asphondylia vincenti* Felt.

LACTUCA (wild lettuce)
Irregular stem gall, diameter, 1.75 cm.....*Lasioptera lactucæ* Felt.

LAPORTEA (wood nettle)
Irregular, oval stem gall.....*Cecidomyia* sp.
Irregular, probably bud gall, length, 1.2 cm.....*Cecidomyia* sp.

LARREA (creosote bush)
Gall undescribed.....*Asphondylia auripila* Felt.

LATHYRUS MARITIMUS (beach pea)
Rolled leaflets, length, 1 to 2 cm.....*Dasyneura maritima* Felt.

LEPIDIUM (pepper grass)
Swollen, discolored seed capsules.....*Dasyneura lepidii* Felt.

LESPEDEZA VIOLACEA
Stem gall, length, 5 mm.; diameter, 3 mm.....*Cecidomyia* sp.

LILIUM SUPERBUM (lily)
Larvæ on leaves.....*Mycodiplosis carolina* n. sp.

LIRIODENDRON (tulip tree)
Purplish, blister gall on leaf.....*Thecodiplosis liriodendri* O. S.
Midrib, polythalamous leaf gall, length, 1.5 cm.....*Cecidomyia tulipiferæ* O. S.
Globular, midrib or vein gall, monothalamous, length, 5 mm.....*Cecidomyia* sp.

LUPINUS (Lupine)
Reared from undescribed gall.....*Lasioptera lupini* Felt.
Reared from leaflets.....*Dasyneura trifolii* Loew.

LYCOPERSICUM ESCULENTUM (tomato)
Reared from flowers.....*Contarinia lycopersici* Felt.

LYCOPUS (bugle weed)
Subglobular stem gall, length, 8 to 10 mm.....*Lasioptera lycopi* Felt.
Fusiform stem gall, length, 1.5 to 2 cm.....*Lasioptera mitchellæ* Felt.

LYSIMACHIA (loose strife)
Loose, apical bud gall.....*Dasyneura lysimachiæ* Beutm.
Gall undetected, possibly from vegetable matter.....*Lestremia solidaginis* Felt.

MAIANTHEMUM (false lily-of-the-valley)
Blister gall, brown, diameter, 6 mm.....*Cecidomyia* sp.

MANIHOT (Cassava)
Leaf galls.....*Itonida manihot* Felt.

MANGIFERA (mango)
Reared from subcortical gall.....*Asynapta mangiferæ* Felt.

MEDICAGO (alfalfa)
Seed pods of alfalfa.....*Asphondylia* sp.

MENTHA (mint)

Axillary or terminal bud gall, length, 4 mm ..... *Dasyneura aromaticæ* Felt.
Terminal bud gall, length, 3 mm.; on *M. gentilis* ..... *Cecidomyia* sp.
Loose, bud gall, length, 3 mm.; on *M. piperita* ..... *Dasyneura piperitæ* Felt.
Pustulate gall in axil of leaf, diameter, 3.5 mm.; on *M. canadensis.*
Giardomyia menthæ Felt.
Polythalamous stem gall, length, 6 to 12 mm ..... *Neolasioptera menthæ* Felt.

MENTZELIA

Reared from flower buds ..... *Asphondylia mentzeliæ* Ckll.

MIMULUS (monkey flower)

Stem gall undescribed ..... *Neolasioptera mimuli* Felt.

MONARDA FISTULOSA (wild bergamot)

Variable stem gall, length, 10 to 22 mm ..... *Cecidomyia monardi* Brodie.

MUHLENBERGIA

Fusiform stem enlargement ..... *Asteromyia agrostis* O. S.

MYRICA CERIFA (wax myrtle)

Bud galls ..... *Cecidomyia myricæ* Beutm.

MYRICA ASPLENIFOLIA (sweet fern)

Fleshy, vein folds, length, 2 to 4 mm ..... *Janetiella asplenifolia* Felt.

NEMOPANTHUS (mountain holly)

Oval bud gall, length, 5 mm ..... *Asphondylia ilicoides* Felt.

NYSSA (black or sour gum)

Marginal leaf fold, length, 2.5 to 3.5 mm ..... *Cecidomyia nyssæcola* Beutm.
Twig gall, length, 4 to 5 cm.; diameter, 8 mm ..... *Cecidomyia* sp.

OECIDIUM

Larvæ on *O. impatientis* ..... *Mycodiplosis impatientis* Felt.
Larvæ on *O. importatum* ..... *Mycodiplosis* sp.

OPUNTIA (Cactus)

Swollen fruit ..... *Asphondylia betheli* Ckll.
Very large, swollen fruit ..... *Asphondylia arizonensis* Felt.
Gall undescribed ..... *Asphondylia opuntiæ* Felt.
Decayed spots at base of spines ..... *Itonida opuntiæ* Felt.

OSTRYA (hop hornbeam)

Terminal folded leaves ..... *Cecidomyia* sp.

OXYBAPHUS

Stem gall, length, 1.5 to 2 cm ..... *Lasioptera allioniæ* n. sp.

PACHISTIMA MYRSONITIS

Terminal leaves folded, dark red ..... *Cecidomyia* sp.

PAEONIA (peony)

Decaying roots ..... *Joanissia pennsylvanica* n. sp.

PANICUM (panic grass)

Ovipositing in stem ..... *Lasioptera panici* Felt.

PAPAVER (poppy)

Stem gall, undescribed ..... *Clinodiplosis caulicola* Coq.

PICEA (spruce)

Reared from seed ..... *Dasyneura canadensis* Felt.

PINUS (pine)

Apical, bud-like swelling, diameter, 1 cm.; on *P. scopulorum.*
Dicrodiplosis gillettei n. sp.
Globose swelling at base of needles; on *P. inops* .... *Cecidomyia brachynteroides* O. S.
Resinous cocoons on needles ..... *Cecidomyia inopis* O. S.
Aborted needle clusters, base subglobose; on *P. rigida* .. *Cecidomyia pinirigidæ* Pack.
Similar needles on *P. edulis* ..... *Cecidomyia* sp.
Base of needles of *P. radiata* ..... *Thecodiplosis piniradiatæ* Snow & Mills.
Reared from extruded resinous masses on *P. rigida* ..... *Itonida resinicola* O. S.
Reared from extruded resinous masses on *P. radiata* ..... *Itonida resinicoloides* Wlms.
Reared from bark of *P. inops* ..... *Winnertzia pinicorticis* Felt.
Reared from Scolytid galleries in pine ..... *Monardia pinicorticis* Felt.
Cecidomyia hopkinsi n. sp.
Reared from fungous affected heartwood, *P. rigida* ..... *Monardia lignivora* Felt.

PISONIA ACULEATA (Wait-a-bit)

Subconic stem gall ..... *Brugmanniella mexicana* n. sp.

PLANTAGO (plantain)

Gall undetected ..... (?) *Lestodiplosis* sp.

PLATANUS (plane tree)

Reared from rolled leaves ..... *Lestodiplosis platanifolia* Felt.

POA PRATENSIS (June grass)

Gall unrecognized ..... *Colpodia pratensis* Felt.

POLYGONATUM (Solomon's seal)

Blister gall, diameter, 4 mm ..... *Cecidomyia* sp.

POPULUS (poplar)

Irregular, monothalamous, blister leaf gall ..... *Cecidomyia* sp. (*irregularis* Steb.)
Subglobular leaf galls ..... *Rhizomyia absobrina* Felt.
Variable, subglobular leaf gall ..... *Dicrodiplosis populi* Felt.
Apparently the same gall ..... *Lestodiplosis globosus* Felt.
Subglobular leaf gall, diameter, 3 to 4 mm ..... *Mycodiplosis populifolia* Felt.
Irregular, tumid gall at base of leaf, similar to that of *Lasioptera vitis* .. *Cecidomyia* sp.
Marginal leaf roll, length, 1cm ..... *Lestodiplosis populifolia* Felt.
Brown, marginal leaf roll, length, 2.5 cm., several larvæ ..... *Cecidomyia* sp.

Longitudinal fold galls dwarfing leaf.....*Cecidomyia* sp.
Oval, white cocoons on twigs.....*Rhabdophaga populi* Felt.
Irregular, subconical twig or petiole gall, length, 1 cm.....*Cecidomyia* sp.
Decaying wood.....*Kronomyia populi* n. sp.

POPULUS CANDICANS (Balm of Gilead)

Roundly conic leaf gall, diameter, 3 mm.....*Cecidomyia* sp.

PORTULACA OLERACEA

Stem gall.....*Lasioptera portulaccæ* Felt.

POTENTILLA (cinquefoil)

Internodal stem gall.....*Cecidomyia* sp. (*potentillæcaulis* Steb.)

PROSOPIS (mesquite)

Aborted fruit.....*Asphondylia prosopsidis* Ckll.
Fusiform bud gall.....*Cecidomyia* sp.

PRUNUS (CHERRY)

Swollen deformed fruit, *P. virginiana*.....*Contarinia virginianiæ* Felt.
Swollen deformed fruit, *P. virginiana*.....*Parallelodiplosis acernea* Felt.
Swollen deformed fruit, *P. virginiana*.....*Itonida canadensis* n. sp.
Swollen deformed fruit, *P. virginiana*.....*Arthrocnodax apiphila* Felt.[1]
Swollen deformed fruit, *P. virginiana*.....*Lestodiplosis* sp.[1]
Apparently from same gall.....*Rhizomyia absobrina* Felt.
Probably from same gall.....*Cecidomyia cerasiphila* n. sp.
Swollen deformed fruit on wild cherry, *P. ? melanocarpa*..*Dasyneura pergandei* n. sp.
Elliptical, polythalamous gall on raceme axis, length, 27 mm., *P. virginiana*.
Cecidomyia sp. (*racemi* Steb.)
Irregular, thickened, folded leaf; on *P. virginiana*....*Mycodiplosis cerasifolia* Felt.
Terminal shoot and bud gall, diameter, 1.5 cm.; on *P. serotina*.
Cecidomyia serotinæ O. S.
Variable, oval or fusiform twig galls; on *P. serotina*.....*Cecidomyia* sp.
Lestodiplosis cerasi Felt.

PSEDRA (Virginia creeper)

Tumid rib gall, length, 1 cm.....*Cecidomyia* sp.
Irregular root gall, 2 to 3mm.....*Cecidomyia* sp.

PYRUS (pear)

Deformed young fruit.....*Contarinia pyrivora* Riley.

QUERCUS (oak)

Fruit

Reared from larvæ found between the seed coats of an acorn..*Dasyneura glandis* Felt.

Flower Galls

Reared from undescribed galls on blossoms of oak.....*Lasioptera quercifloræ* Felt.

[1] Predaceous or scavenger.

Leaf Galls

Leaf edge galls.

Gall a folded leaf edge between serrations.....*Itonida foliora* Rssl. & Hkr.
Similar gall, possibly identical.....*Cecidomyia erubescens* O. S.

Vein galls.

A narrow, dark purplish, fusiform, thin-walled swelling on the under side of the mid or lateral veins may contain two or more orange larvæ, length, 8 mm.....*Cincticornia podagræ* Felt.
Gall very similar to, if not identical with the above...*Cincticornia majalis* O. S.
Elongate, pocket-like swellings along midrib of round-leaved scrub oak.
Clinodiplosis florida Felt.
An elongate fold gall close to the midrib on the under surface, length, 12 mm.; diameter, 1 mm.; on *Quercus tinctoria*.....*Cecidomyia oruca* Walsh.
A large midrib fold with a conspicuous white pubescence.
Cecidomyia niveipila O. S.

Globose or subglobose, thickened, usually reddish, galls.

Reddish, oval, irregular, wrinkled leaf gall, diameter, 3 to 4 mm.
Cincticornia pilulæ Walsh.
A similar gall, apparently Southern, possibly made by the same species.
Cincticornia symmetrica O. S.
Gall similar to though much smaller than that of *Cincticornia pilulæ*.
Dasyneura florida Felt.
Reared from oak, presumably from a gall resembling that made by Cynips.
Thecodiplosis quercifolia Felt
A subhemispheric, brown, slightly nippled, monothalamous gall on the under side of the leaf, diameter, 1.75 mm.....*Cincticornia globosa* Felt.
Globular gall, diameter, 4 mm. on under side of running oak leaf.
Youngomyia quercina n. sp.

Flattened, pustulate or blister galls.

A flat, relatively inconspicuous, probably blister gall...*Cincticornia quercifolia* Felt.
A slight circular, blister-like swelling on the lateral veins, length, 3 mm., diameter, 1 mm.....*Cincticornia americana* Felt.
A broadly, yellow margined, circular, blister gall, diameter, 3 mm.
Cincticornia serrata Felt.
A variable brown, irregularly oval, pustulate swelling, 5 to 6 mm. in diameter.
Cincticornia pustulata Felt.
An irregularly oval, pustulate swelling, 5 to 6 mm. in diameter, showing equally on both surfaces but with no nipple.....*Cincticornia simpla* Felt.
Reared from a similar gall.....*Cincticornia sobrina* Felt.
Probably reared from oak leaves.....*Dicrodiplosis quercina* Felt.

Twig Galls

Reared from twigs of white oak, *Quercus alba*.....*Lasioptera querciperda* Felt.

Stems

Under decaying bark.....*Leptosyna querci* n. sp.
Miastor americana Felt.
Itonida cincta n. sp.

RHODODENDRON NUDIFLORUM (purple azalea)

Fusiform, brownish bud gall, length, 7 mm.....*Asphondylia azaleæ* Felt.

RHUS (sumac)

Subglobular flower bud gall, diameter, 3 mm..... *Asphondylia integrifoliæ* Felt.
Stunted heads or curled leaves..... *Arthrocnodax rhoina* Felt.
Subcortical stem gall..... *Cecidomyia* sp.
Globose root galls..... *Dasyneura rhois* Coq.

RIBES (currant, gooseberry)

Arrested buds (gooseberry)..... *Rhopalomyia grossulariæ* Felt.
Gall undescribed, on *R. menziesii*..... *Phytophaga californica* Felt.
Red, prematurely ripe fruit..... (?) *Dasyneura grossulariæ* Fitch.
Irregular, dark brown blister gall, diameter, 3 mm.; on *R. longifolum*.
Cecidomyia sp.

RIVINA (rouge-plant)

Reared from bud gall..... *Schizomyia rivinæ* Felt.

ROBINIA (common locust)

Folded young leaflets..... *Dasyneura pseudacaciæ* Fitch.
Rolled leaf margins..... *Obolodiplosis orbiculata* Felt.

ROSA (rose)

Curled or folded terminal leaves..... *Dasyneura ? rosarum* Hardy.
Rose buds..... *Dasyneura rhodophaga* Coq.
Rose buds..... *Clinodiplosis rosivora* Coq.
Apical, loose bud or rosette gall, length, 2 to 2.5 cm..... *Rhabdophaga rosacea* Felt.

RUBUS (blackberry)

Reared from blossoms..... *Dasyneura rubifloræ* Felt.
Warty, pruinose leaf gall 1 to 3 cm. long..... *Lasioptera farinosa* Beutm.
Marginal leaf roll, length, 4 to 6 cm..... *Camptoneuromyia rubifolia* Felt.
Subglobular, filamentous vein gall on *R. nigrobaccus*..*Cecidomyia* sp. (*muscosa* Steb.)
Irregular, subcortical stem gall, length, 2 cm..... *Lasioptera nodulosa* Beutm.

RUDBECKIA (cone flower)

Irregular, subglobular apical gall, diameter, 4 cm..... *Asphondylia conspicua* O. S.
Deformed, enlarged florets, the affected florets leafy...*Cecidomyia rudbeckiæ* Beutm.
Nodular stem gall..... *Cecidomyia* sp.
Undetected gall, possibly from the unmodified stem....*Lasioptera rudbeckiæ* Felt.

RUMEX (dock)

Reared from deformed, reddish seeds..... *Contarinia rumicis* Loew.
Reared from same gall..... *Lestodiplosis rumicis* Felt.

SALIX (Willow)

Fruit Galls

Enlarged seeds, reddish brown..... *Cecidomyia*, sp.

Leaf Galls

Fusiform pod or curled leaves, length, 10 mm..... *Dasyneura salicifolia* Felt.
Closely rolled terminal leaves..... *Rhabdophaga plicata* Felt.
Yellowish, red spotted, flattened gall, diameter, 2 to 3 mm.
Oligotrophus salicifolius Felt.

Subconic, truncate, greenish yellow, lipped gall, diameter, 2 mm.
Hormomyia verruca Walsh.
Apparently reared from same gall.....*Clinorhyncha filicis* Felt.

Bud Galls

Spongy or clustered rosette gall.....*Phytophaga walshii* Felt.
Small, rosette gall, length, 2 cm.....*Rhabdophaga racemi* Felt.
Oval, small, rosette gall resembling a small *R. brassicoides* gall.
Rhabdophaga normaniana Felt.
Large, loose, rosette gall, length, 1 to 2 cm.....*Rhabdophaga rhodoides* Walsh.
Large, open, rosette or cabbage gall, diameter, 1 to 2 cm.
Rhabdophaga brassicoides Walsh.
Reared from above gall.....*Dasyneura orbitalis* Walsh.
Reared from above gall.....*Lestodiplosis septemmaculata* Walsh.
Reared from above gall.....*Rhopalomyia frater* Ckll.
Pine cone gall, length, 2 to 2.5 cm.....*Rhabdophaga strobiloides* Walsh.
Reared from above gall.....*Dasyneura annulipes* Walsh.
Reared from above gall.....*Dasyneura atricornis* Walsh.
Reared from above gall.....*Cecidomyia atrocularis* Walsh.
Reared from above gall.....*Dasyneura albovittata* Walsh.
Reared from above gall.....*Lestodiplosis decemmaculata* Walsh.
Pine cone gall resembling a slender *R. strobiloides* gall..*Rhabdophaga persimilis* Felt.
Ovate, terminal bud gall, diameter, 1 cm.....*Rhabdophaga gnaphaloides* Walsh.
Small bud gall.....*Dasyneura californica* Felt.
Small bud gall.....*Rhabdophaga gemmæ* Felt.
Reared from apparently normal bud.....*Rhabdophaga latebrosa* Felt.
Small, conic, apical bud gall.....*Dasyneura gemmæ* Felt.

Twig Galls

Reared from willow twigs, gall undescribed.....*Asphondylia salictaria* Felt.
Larvæ in subcortical cells, no swelling.....*Dasyneura corticis* Felt.
Slender twigs, slightly enlarged.....*Sackenomyia packardi* Felt.
Slender twigs, slightly enlarged.....*Sackenomyia porteræ* Ckll.
Slender twigs, slightly enlarged.....*Phytophaga caulicola* Felt.
Slender twigs, slightly enlarged.....*Rhabdophaga caulicola* Felt.
Twigs probably hardly enlarged.....*Phytophaga perocculta* Ckll.
Slender twigs, slightly enlarged.....*Phytophaga americana* Felt.
Twigs uniformly enlarged, gall 5 to 7 cm. long.....*Rhabdophaga podagræ* Felt.
Gall similar to above, cells in wood.....*Rhabdophaga cornuta* Walsh.
Twigs irregularly enlarged, galls 1 to 3 cm. long.....*Rhabdophaga salicis* Schr.
Twigs irregularly enlarged, gall, 1 to 3 cm. long, buds dwarfed.
Rhabdophaga triticoides Walsh.
Apical, fusiform, beaked gall, length, 2 cm.....*Phytophaga rigidæ* O. S.
Reared from similar gall.....*Rhabdophaga sodalitalis* Felt.
Nodular gall at base of twig, length, 8 mm.....*Rhabdophaga nodulosa* Walsh.
Inconspicuous knot or twig enlargements.....*Phytophaga latipennis* Felt.
Subglobular, lateral gall with dead area on one side, diameter, 9 mm.
Rhabdophaga globosa Felt.
Irregular, ovoid or subglobular galls, diameter, 1 to 2 cm.
Rhabdophaga batatas Walsh.
Same gall as above.....*Rhabdophaga ramuscula* Felt.
Same gall dried.....*Asynapta saliciperda* Felt.
Subglobose galls, the surface scarred, diameter, 4 mm...*Phytophaga tumidosæ* Felt.

SAMBUCUS (elder)

Bud gall, diameter, 1.5 cm. ..... *Asphondylia sambuci* Felt.
Swollen, unopened florets ..... *Youngomyia umbellicola* O. S.
Rolled leaves ..... *Arthrocnodax sambucifolia* Felt.
Irregular, subcortical gall, length, 2 to 4 cm. ..... *Neolasioptera sambuci* Felt.

SCIRPUS (bulrush)

Gall undescribed ..... *Cecidomyia* sp.

SCROPHULARIA (figwort)

Reared from distorted flower bud ..... *Lestodiplosis scrophulariæ* Felt.

SECALE (rye)

Reared from heads ..... *Itonida tritici* Kirby.

SENECIO (ragweed)

Stem gall undescribed ..... *Lasioptera arizonensis* n. sp.
Flower heads ..... *Cecidomyia* sp.

SCUTELLARIA (skullcap)

Oval, greenish stem gall, length, 8 mm. ..... *Cecidomyia* sp.

SETARIA GLAUCA (fox tail)

Reared from seeds ..... *Contarinia sorghicola* Coq.

SICCA (Otaheiti gooseberry)

Unripe fruit ..... *Asphondylia siccæ* Felt.

SISYMBRIUM (hedge mustard)

Irregular bud gall, diameter, 8 mm. ..... *Dasyneura ? sisymbrii* Schr.

SMILAX HERBACEA (carrion flower)

Blister gall, diameter, 4 mm. ..... *Cecidomyia* sp.

SMILAX ROTUNDIFOLIA (green brier)

Reared from oval, blister-like leaf spots ..... *Camptoneuromyia rubifolia* Felt.
Young leaves rolled longitudinally ..... *Dasyneura smilacifolia* n. sp.

SMILICINA (false spikenard)

Deformed berries ..... *Asphondylia smilicinæ* Felt.
Root gall ..... *Dasyneura* sp.

SOLANUM CAROLINENSE (horse nettle)

Irregular, spiny stem gall, length, 3.75 to 5 cm. ..... *Neolasioptera solani* Felt.

SOLIDAGO (goldenrod)

Flower Galls

Greenish or reddish, subglobular, bud-like gall, diameter, 2 mm.; on *S. canadensis*.
Rhopalomyia racemicola O. S.
Green, densely pubescent, cylindric gall, length, 6 mm.; on *S. canadensis*.
Rhopalomyia anthophila O. S.
Reared from undescribed flower gall ..... *Rhopalomyia cruziana* Felt.

Reared from apparently unaffected florets.....*Asphondylia monacha* O. S.
Gall undescribed, apparently unaffected florets.....*Asphondylia johnsoni* Felt.

Bud Galls

Apical bud galls.

Loose, convolute mass of developing leaves, diameter, 6.5 mm.
Asteromyia convoluta Felt.

Loose apical pod of narrow, adherent leaves on *S. canadensis*.
Dasyneura folliculi Felt.

Gall composed of two or more leaves with edges adherent, length, 2.5 to 5 cm.; on *S. graminifolia*.....*Dasyneura flavicornis* Felt.

Gall closely adherent, pyriform, apical, length, 1 mm.
Camptoneuromyia flavescens Felt.

Probably a loose, apical bud gall on *S. graminifolia*.
Dasyneura carbonaria Felt.

Subglobose, white or brownish apical galls on stems or subterranean root stocks, diameter, 2.5 cm.; on *S. juncea*.....*Rhopalomyia hirtipes* O. S.

Apical, cylindric, bud gall on subterranean root stock, length, 6 mm.; diameter, 2.5 mm.....*Rhopalomyia bulbula* Felt.

Apical rosette galls.

On *Solidago canadensis*.

Deformed head about 11 cm. in diameter, 3 cm. high; composed of numerous smaller heads.....*Rhopalomyia carolina* Felt.

Gall globular, head 4 to 5 cm. in diameter.....*Rhopalomyia solidaginis* Loew.

Large, rosette gall similar to the above.....*Rhopalomyia albipennis* Felt.

Reared from similar gall.....*Lestodiplosis carolinæ* Felt.

Reared from similar gall.....*Lestodiplosis solidaginis* Felt.

Large, terminal, rosette gall.....*Oligotrophus inquilinus* Felt.

On *Solidago canadensis* and *S. serotina*.

Gall large, diameter, 2.5 cm.; composed of numerous small cells.
Rhopalomyia capitata Felt.

Reared from same gall as above.....*Rhopalomyia inquisitor* Felt.

On *Solidago graminifolia*.

Gall, green, resembling that of *Œdaspis polita*, diameter,1 to 1.5 cm.
Asphondylia monacha O. S.

Presumably reared from the same gall.....*Camptoneuromyia flavescens* Felt.

Gall, very similar to the above, the maker possibly inquiline.
Rhopalomyia lanceolata Felt

On *Solidago sempervirens*.

Gall, similar to that described above.....*Asphondylia monacha* O. S.

Leaf Galls

Galls attached to one, or at most two leaves and producing a marked deformity.

On *Solidago graminifolia*.—Gall greenish, red marked, ribbed, fusiform, sessile, length, 6 mm.....*Rhopalomyia fusiformis* Felt.

Gall, green, red marked, fusiform, stemmed, length, 13 to 14 mm.
Rhopalomyia pedicellata Felt.

On *Solidago puberula* or *S. juncea*.—Gall greenish, irregular, oval, length, 1 cm.; composed of clusters of root leaves.....*Dasyneura radifolii* Felt.

On *Solidago rugosa*.—Gall green, red marked, fusiform, length, 1.6 mm.
Rhopalomyia clarkei Felt.

On *Solidago canadensis* and *S. serotina*.—Oval gall between adherent leaves, diameter, 2 mm. ..... *Asphondylia monacha* O. S.
Reared from similar gall ..... *Camptoneuromyia adhesa* Felt.
Possibly reared from similar gall ..... *Lasioptera argentisquamæ* Felt.
Possibly reared from similar gall ..... *Trotteria solidaginis* Felt.

Blister-like galls occurring in the leaf tissues and not producing a marked deformity.
Gall oval, black, 4 to 5 mm. long; on *S. graminifolia* .. *Asteromyia carbonifera* Felt.
Grayish brown, black margined, irregular gall, diameter, 3 mm.; on *S. squarrosa*. *Asteromyia squarrosæ* Felt.
Marginal, golden gray, circular gall, diameter, 3.5 mm.; on *S. canadensis*. *Asteromyia flavoanulata* Felt.
A variable pink or rosy, circular gall, diameter, 1 cm.; on *S. rugosa*. *Asteromyia rosea* Felt.
Presumably reared from oval, blister gall on *S. canadensis*. *Asteromyia socialis* Felt.
Reared from blister gall on Solidago and also from aster, gall on latter with diameter 3 to 4 mm. ..... *Asteromyia albomaculata* Felt.
Variegated, oval gall, diameter, 3 to 6 mm.; the older galls mostly black, the younger yellowish olive with a darker central nipple; on *S. rugosa*. *Asteromyia rubra* Felt.
Apparently reared from similar gall ..... *Lestodiplosis rugosa* Felt.
Marginal, semi-oval, yellowish gall, length, 1 cm.; on *S. canadensis*. *Asteromyia flavolunata* Felt.
Elongate, yellowish brown, blistered area, length, 3 cm.; on *S. canadensis*. *Lestodiplosis triangularis* Felt.

Stem Galls

On *Solidago graminifolia*.—Gall greenish, red marked, ribbed, fusiform, sessile, length 6 mm. ..... *Rhopalomyia fusiformis* Felt.
Gall green, red marked, fusiform, stemmed, length, 13 to 14 mm. *Rhopalomyia pedicellata* Felt.
Gall green, subglobular, near tip, diameter, 1.5 cm. ..... *Rhopalomyia lobata* Felt.
Gall a uniform enlargement of the stem, length, 10 cm., diameter, 7 mm. *Lasioptera cylindrigallæ* Felt.
On Solidago, various species.—Irregular, subglobose or fusiform enlargement, length, 2.5 cm. ..... *Lasioptera tumifica* Beutm.
Gall globose or subglobose, smooth, brownish, apical on either aërial or subterranean stems, diameter, 2.5 cm.; on *S. juncea* ..... *Rhopalomyia hirtipes* O. S.
Solitary or clustered, ovoid, fleshy gall on root stock .... *Rhopalomyia thompsoni* Felt.

SORGHUM

Reared from seeds ..... *Contarinia sorghicola* Coq.

SPIRÆA SALICIFOLIA (meadow sweet)

Slightly enlarged, reddened flowers ..... *Itonida spiræafloræ* Felt.
Reared from unopened flowers ..... *Prodiplosis floricola* Felt.
Deformed, deep red or purplish and greenish leaf buds, length, 1 cm., diameter, 4 mm. ? *Asphondylia* sp.
Terminal, globular bud gall, diameter, 4 mm. ..... *Hormomyia clarkei* Felt.
Terminal brown bud gall, diameter, 3 mm ..... *Itonida spiræina* n. sp.
Terminal, clustered bud gall, diameter, 3 mm.; length, 7 mm. *Parallelodiplosis clarkei* n. sp.

Terminal bud gall, the leaflets fringed, diameter, 3 to 4 mm. . . . . *Cecidomyia* sp.
Terminal "cabbage" or "lettuce" bud gall. . . . . *Contarinia spiræina* n. sp.
Thickened, greenish midrib fold, length, 1 to 1.5 cm. . . . . *Rhabdophaga salicifolia* Felt.
Apparently reared from same gall. . . . . *Lestodiplosis spiræafolia* Felt.
Marginal leaf rolls, length, 3 mm. . . . . *Parallelodiplosis spiræ* Felt.
Yellowish brown, spotted, blister galls, diameter, 3 mm. . . . *Lasioptera spiraeafolia* Felt.

TAXODIUM (bald cypress)

A conical, globular or elongate deformation of the leaf. . . . . *Itonida taxodii* n. sp.
Fusiform twig gall, length, 1.25 cm. . . . . *Thecodiplosis ananassi* Riley.

TECOMA (trumpet creeper)

Reared from curled leaves. . . . . *Itonida tecomiæ* Felt.

THALICTRUM (meadow rue)

Enlarged seed pods, length, 8 mm. . . . . *Asphondylia thalictri* n. sp.
From same gall, probably zoophagous. . . . . *Trotteria* sp.

TILIA (basswood)

Irregular swelling on twig and petiole. . . . . *Cecidomyia citrina* O. S.
Subglobular, brownish leaf galls, diameter, 3 mm. . . . . *Cecidomyia verrucicola* O. S.
Apparently reared from above gall. . . . . *Porricondyla dilatata* Felt.
Irregular, distorted galls at base of leaf or along midvein, subglobular.
Colpodia pectinata Felt.

TRIDENS FLAVUS (tall red top)

Reared from seeds. . . . . *Contarinia sorghicola* Coq.

TRIFOLIUM (clover)

Folded leaflets variably discolored with reddish and yellowish; on *T. repens.*
Dasyneura trifolii Loew.
Yellowish larvæ in flower heads; on *T. pratense*. . . . . *Dasyneura leguminicola* Lintn.

TRIPSACUM (sesame grass)

Larvæ between leaf blades. . . . . *Lasioptera tripsaci* Felt.

TRITICUM (wheat)

Reared from wheat heads. . . . . *Itonida tritici* Kirby.
Associated with the above. . . . . *Cecidomyia inimica* Fitch.
Associated with the above. . . . . *Lestodiplosis graminis* Fitch.
Under the leaf sheath. . . . . *Phytophaga destructor* Say.
Probably the same. . . . . *Cecidomyia culmicola* Morr.

ULMUS (elm)

Decaying bark. . . . . *Oligarces ulmi* n. sp.
Aborted buds. . . . . *Dasyneura ulmea* Felt.
Adherent, immature, terminal leaves or leaf buds. . . . . *Phytophaga ulmi* Beutm.

UNKNOWN PLANTS

Irregular, subglobular bud gall, diameter, 6 mm. . . . . *Asphondylia florida* Felt.
Reared from bud gall. . . . . *Asphondylia baroni* Felt.

Irregular, subglobular to elongate, fusiform stem gall, length, 0.7 to 1.5 cm.
Lasioptera palustris Felt.
Undescribed stem gall.....*Lasioptera spinulæ* Felt.
Undescribed stem gall.....*Neolasioptera hirsuta* Felt.

URTICA (nettle)

Urn-shaped, subsessile, pale green midrib or vein gall, diameter, 3 mm.
Cecidomyia urnicola O. S.
Hoary, pubescent, yellowish white gall on under surface of leaf, diameter, 2 mm.
Cecidomyia sp.

VACCINIUM (cranberry)

Apical bud gall on blueberry.....*Dasyneura cyanococci* Felt.
Oval, valved, midrib gall, length, 3 mm.
Dasyneura gaylussacii (*vaccinii* O. S. not Smith).
Leaf fold or bud gall on cranberry.....*Dasyneura vaccinii* Smith.

VEGETABLE MATTER (dead or decaying)

Reared probably from decaying vegetable matter.....*Prionellus dilatata* Felt.
Reared from manure.....*Cordylomyia coprophila* Felt.
Reared from decaying, fungous infected stump.....*Lasiopteryx flavotibialis* Felt.

VERBENA (vervain)

Reared from marginal leaf rolls.....*Cecidomyia verbenæ* Beutm.
Reared from rolled leaves.....*Lestodiplosis verbenifolia* Felt.
Irregular, oval stem gall, length, 3 to 5 mm.....*Cecidomyia* sp.

VERNONIA (ironweed)

Deformed florets or oval, petiole or midrib gall, length, 6 mm.
Lasioptera vernoniæ Beutm.
Blossoms.....*Youngomyia vernoniæ* n. sp.
Probably bud gall.....*Asphondylia vernoniæ* Felt.

VIBURNUM (arrow-wood)

Globose bud gall, length, 4 mm.....*Schizomyia viburni* Felt.
Minute, blister gall on under side of leaf, diameter, 2 mm.
Cystiphora viburnifolia n. sp.
Purplish swellings on lateral veins, length, 5 mm.....*Sackenomyia viburnifolia* Felt.
Irregular, subcortical gall, length, 2 to 6 cm.; on *V. dentatum*
Neolasioptera viburnicola Beutm.
Marginal leaf roll, length, 10 mm.; on *V. cassinoides*.....*Cecidomyia* sp.
Circular, blister gall, diameter, 1.5 to 2 mm.; on *V. cassinoides*.....*Cecidomyia* sp.
Pustulate, blister-gall with pinkish aureola, diameter, 3 mm.; on *V. acerifolium*.
Cecidomyia sp.
Oval, greenish, blister galls, diameter, 2 mm., larvæ deep red; on *V. dentatum*.
Cecidomyia sp.

VIOLA (violet)

Deformed fruit, irregular, "plum-like," length, 1 cm.....*Dasyneura semenivora* Beutm.
Rolled, discolored leaves.....*Phytophaga violicola* Coq.

VITIS (grape)

Enlarged blossom buds.....*Contarinia johnsoni* Sling.
Clustered, fusiform, woolly, pubescent bud galls; each 1 to 1.5 cm. long.
Schizomyia coryloides Walsh & Riley.
Hard, nut-like, polythalamous bud gall, diameter, 1.5 cm.
Schizomyia pomum Walsh & Riley.
Possibly reared from same gall.....*Rhabdophaga hirticornis* Felt.
Oval, petiole or tendril gall, length, 2.5 cm.....*Schizomyia petiolicola* Felt.
Reared from similar gall.....*Neolasioptera vitinea* Felt.
Reared from similar gall.....*Asteromyia petiolicola* Felt.
Reared from similar gall.....*Lasioptera riparia* Felt.
Irregular, tumid, greenish or reddish leaf or tendril gall, diameter, 0.5 to 1.5 cm.
Lasioptera vitis O. S.
Reared from similar gall.....*Dasyneura vitis* Felt.
Reared from similar gall.....*Rhizomyia vitis* Felt.
Reared from similar gall.....*Brachyneura vitis* Felt.
Reared from similar gall.....*Janetiella brevicauda* Felt.
Elongate, conical, reddish or greenish gall, length, 6 to 9 mm..*Cecidomyia viticola* O. S.
Reared from Phylloxera gall.....*Lestodiplosis grassator* Fyles.

YUCCA (Spanish bayonet)

Reared from pods.....*Dasyneura yuccæ* Felt.
Reared from stem, probably inquiline.....*Lestodiplosis yuccæ* Felt.

ZIZIA (Golden Alexanders)

Fusiform stem gall, length, 3 cm.....*Lasioptera ziziæ* Felt

ZOOPHAGOUS

Reared from Eriophyes gall on ash.....*Endaphis americana* Felt.
Reared from bee hive infested with mites.....*Arthrocnodax apiphila* Felt.
Reared from *Aphis gossypii*.....*Aphidoletes marina* Felt.
Reared from the above.....*Aphidoletes cucumeris* Lintn.
Reared from tulip leaves presumably infested by aphids....*Aphidoletes borealis* Felt.
Reared from *Siphonophora liriodendri*.....*Aphidoletes meridionalis* Felt.
Reared probably from aphids on Tanicetum.....*Aphidoletes basilis* Felt.
Reared from Phylloxera galls.....*Lestodiplosis grassator* Fyles.
Reared from *Hemichionaspis minor*.....*Lestodiplosis peruviana* Felt.
Reared from *Aspidiotus uvæ*.....*Dentifibula cocci* Felt.
Reared from *Saissetia nigra*.....*Diadiplosis cocci* Felt.
Reared from Lecanium on beech leaves.....*Coccidomyia pennsylvanica* Felt.
Reared from Orthezia and Dactylopius.....*Cecidomyia coccidarum* Ckll.
Lobodiplosis coccidarum Felt.
Mycodiplosis coccidivora n. sp.
Dicrodiplosis coccidarum n. sp.
Reared from Tetranychus on lemon.....*Mycodiplosis acarivora* Felt.
Reared from Eriophyes on cotton.....*Arthrocnodax abdominalis* Felt.
Cecid larvæ preying on eggs of *Cicada septendecim*.....*Cecidomyia* sp.

NEW SPECIES OF GALL MIDGES

By E. P. Felt, *Albany, N. Y.*

The following descriptions of Itonidæ relate to species recently reared or to reared forms recently determined as new.

Joanissia pennsylvanica n. sp. *Male.*—Length 1 mm. Antennæ presumably dark brown; fourteen segments, the fifth with a smooth stem about one-fourth longer than the oval subglobose enlargement; terminal segment produced, narrowly oval and with a stout apical process about 1-3 the length of the basal enlargement. Palpi; the first segment subglobose, the second narrowly oval, with a length twice its diameter, the third nearly as long, the fourth narrowly fusiform. Body colors presumably dark brown or fuscous as in other species. Wings hyaline, rather broad, the tip of subcosta apparently obsolete though it reaches about to the basal half of the wing, the third vein united to subcosta just before the point where it disappears by a long, oblique crossvein and joins the margin just beyond the apex, the fifth vein disappearing distally. Metatarsus of the posterior legs about two and one-half times the length of the second segment; claws strongly curved almost at right angles, slender, the pulvilli shorter than the claws. Genitalia apparently of the normal type as in *J. photophila* Felt.

Female.—Length 1.25 mm. Antennæ with eleven segments, the fifth with a stem about as long as the narrowly ovate basal enlargement. Ovipositor short, triarticulate, the terminal lobe narrowly oval and thickly clothed apically with long, stout setae.

Reared from peony roots collected by B. H. Farr of Reading, Pa., and submitted for study by Prof. H. A. Surface. Type C al928.

KRONOMYIA n. g.

The remarkable form described below is evidently allied to Brachyneura Rond., though readily separated therefrom by the four long veins, the fifth and sixth being simple, and the totally different antennal structure. The antennæ in the female of this species have but twelve segments, the apical evidently composed of two closely fused reduced segments, the other flagellate ones with a short stem and a short, stout basal enlargement ornamented with a basal whorl of long, stout setæ and a thick band of short, curved setae. The The biarticulate palpi with the greatly produced, capitate terminal segment and the peculiar ovipositor, all serve to differentiate this species from allied genera. Type *K. populi* n. sp.

Kronomyia populi n. sp. *Female.*—Length 1.75 mm. Antennæ extending to the second abdominal segment, thickly haired, fuscous; twelve segments, the first broadly obconic, the second very short, almost disk-shaped, the third and fourth free, the fifth with a stem about one-fourth the subcylindric basal enlargement, which latter has a length one-half greater than its diameter, a sparse subbasal whorl

of very long, stout setæ and a thick subapical band of shorter, strongly curved setæ; terminal segment produced, with a length over four times its diameter and tapering nearly uniformly to a subacute apex. Palpi; first segment narrowly oval, with a length about one-half greater than its diameter, the second segment with a length three times the first, the basal half slender, the distal portion greatly enlarged and sparsely setose. Mesonotum dark brown. Scutellum sooty white basally, fuscous apically, post-scutellum sooty white. Abdomen with the sclerites fuscous yellowish the incisures and pleuræ whitish. Ovipositor fuscous, the terminal lobes yellowish. Wings fuscous, thickly clothed with narrow scales; costa black, thickly scaled, subcosta uniting therewith at the basal third, the third vein well beyond the apex, the simple fifth at the distal third, the sixth near the basal half, the two latter rudimentary. Halterese whitish basally, fuscous apically; tibiæ and tarsi a somewhat variable fuscous. Claws stout, strongly curved, unidentate, the pulvilli about one-third the length of the claws. Ovipositor strongly curved ventrally and anteriorly, the convex rounded surface chitinized, its surface and the dorsal and ventral plates of the preceding segment with numerous chitinous, finely denticulate, transverse ridges; terminal lobes extending posteriorly, slender, with a length about four times the diameter, narrowly rounded apically and sparsely setose.

Reared from punky poplar wood collected at Nassau, N. Y. Type C. a 2152.

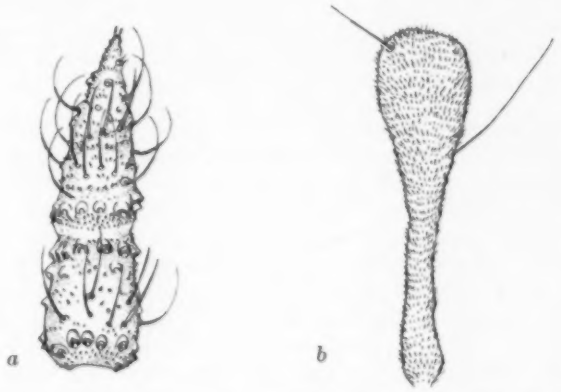


Fig. 11. *Kronomyia populi*, female: *a*, terminal antennal segment; *b*, distal palpus segment (Original)

Oligarces ulmi n. sp. *Male.*—Length 0.8 mm. Antennæ short, very sparsely haired, whitish transparent; eleven segments, the fifth subcylindric, with a length about one-fourth greater than its diameter; terminal segment slightly produced, sometimes nearly fused with the preceding, and with a length nearly one half greater than its diameter, and broadly rounded apically. Mesonotum light brown. Scutellum yellowish transparent, postscutellum slightly fuscous. Abdomen yellowish orange, reddish basally, the genitalia a light fuscous. Halteres whitish transparent. Legs yellowish transparent; claws long, moderately stout, nearly straight, the pulvilli rudimentary. Genitalia; basal clasp segment moderately long, stout, obliquely truncate; terminal clasp segment long, stout, swollen near the middle, broadly rounded apically and thickly setose; dorsal plate short, broadly and roundly emarginate, the lobes broadly rounded and sparsely setose; ventral plate long,

broadly and roundly emarginate, the lobes short, broadly rounded and sparsely setose. Style long, tapering, narrowly rounded apically. Occasionally a pale yellowish male may be observed.

Reared in large numbers from decaying elm bark collected at Nassau, N. Y., March 11, 1911. Type C. a2136.

Winnertzia pectinata n. sp. *Male.*—Length, 1.75 mm. Antennæ fuscous yellowish; fourteen segments, the fifth with a stem three-fourths the length of the subcylindric basal enlargement, which latter has a length one half greater than its diameter; terminal segment with a length about twice its diameter, narrowly rounded apically. Palpi yellowish transparent, first segment with a length fully two and one half times its diameter, the second with a length thrice its diameter, the third a little longer than the second, the fourth fully one-half longer than the third. Face fuscous yellowish. Mesonotum dull fuscous brown. Scutellum and postscutellum brownish black. Abdomen fuscous yellowish, the small, irregularly ovoid dorsal sclerites slightly fuscous; terminal segments and gentalia fuscous. Wings hyaline, costa dark brown. Halteres yellowish transparent. Coxae and femora mostly yellowish transparent; tibiæ light fuscous yellowish; tarsi mostly fuscous yellowish, the fifth segment of the midtarsi yellowish; claws stout, strongly curved, unidentate, the pulvilli short. Genitalia; basal clasp segment moderately long, stout; terminal clasp segment long, swollen at the distal fourth and apically with a strongly pectinate chitinous spur; dorsal plate moderately long, broad, broadly and slightly emarginate, the lobes broadly rounded; ventral plate long, deeply and triangularly emarginate, the lobes broad, truncate and sparsely haired.

Reared from partly decayed chestnut bark collected at Nassau, N. Y., April 26, 1911. Allied to *W. calciequina* Felt. Type C. a2109.

Rhizomyia hirta n. sp. *Female.*—Length 1 mm. Antennæ rather thickly haired; twelve segments, the fifth with a stem one-fourth the length of the cylindric basal enlargement, which latter has a length two and one half times its diameter; terminal segment with a length six times its diameter. Palpi; first segment short, stout, the second subrectangular, with a length four times its diameter, the fourth a little longer, slender. Mesonotum fuscous yellowish. Scutellum, postscutellum and abdomen reddish yellow, the basal segment fuscous. Wings hyaline, costa dark brown, subcosta uniting therewith at the basal fourth. Halteres yellowish, fuscous subapically. Coxæ and femora basally yellowish; femora distally and tibiæ fuscous yellowish, the tarsi darker; claws long, slender, strongly curved, the pulvilli shorter than the claws. Ovipositor short, terminal lobes broadly ovate and sparsely setose.

Reared from a reddish, blister-like leaf mine on Cratægus taken at Bath, N. Y. Type C. a1756a.

Dasyneura communis n. sp. *Male.*—Length 1.3 mm. Antennæ dark brown; sixteen segments, the fifth with a stem three-fourths the length of the cylindric basal enlargement, which latter has a length one-half greater than its diameter; terminal segment produced, tapering to a narrowly rounded apex with a length five times its diameter. Palpi; first segment short, incrassate, the second narrowly oval, the third one-half longer, slender, the fourth one-fourth longer and more slender. Mesonotum shining dark brown. Scutellum and postscutellum dark brown. Abdomen

dark brown, the segments margined posteriorly with yellowish setæ; membrane and pluræ yellowish orange; venter orange yellowish; genitalia fuscous yellowish. Wings hyaline, costa dark brown. Halteres yellowish orange. Coxæ fuscous yellowish; femora and tibiæ mostly cinereous, slightly fuscous apically; tarsi mostly dark brown; claws long, slender, strongly curved, the pulvilli as long as the claws. Genitalia; basal clasp segment stout, truncate; terminal clasp segment rather long, stout; dorsal plate broad, deeply and triangularly emarginate, the lobes narrowly rounded and sparsely clothed with long setæ apically; ventral plate long, deeply and broadly emarginate, the lobes tapering to a narrowly rounded, sparsely setose apex. Harpes broad, stout, irregular apically; style short, stout.

Female.—Length 1.5 mm. Antennæ fuscous yellowish; sixteen subsessile segments, the fifth with a length three-fourths greater than its diameter; terminal segment produced, narrowly rounded apically. Palpi; first segment short, stout, irregular, second subquadrate, with a length three times its width, the third one-half longer, slender, the fourth one half longer than the third. Mesonotum shining dark brown, the submedian lines thickly haired. Scutellum dark reddish brown, postscutellum dark orange. Abdomen dark brown, the segments sparsely setose posteriorly; membrane, pluræ and venter dark reddish; ovipositor pale orange. Wings hyaline, costa dark brown. Halteres yellowish basally, reddish orange apically. Coxae fuscous orange; femora and tibiæ yellowish straw; tarsi slightly darker, especially the distal segments. Ovipositor as long as the abdomen, the terminal lobes narrow oval sub-acute apically.

Reared from jar containing maple leaves bearing reddish tinted pouch, vein galls ¼ inch long. Type C. a1133.

Dasyneura gibsoni n. sp. *Male.*—Length 1.5 mm. Antennæ dark brown; fifteen segments, the fifth with a stem one fourth longer than the cylindrical basal enlargement, which latter has a length one fourth greater than its diameter; terminal segment reduced, narrowly oval. Palpi; first segment short, subquadrate, the second with a length nearly three times its width, narrowly rounded, the third one half longer than the second, slender, the fourth nearly as long as the third, somewhat dilated. Mesonotum dark brown. Scutellum reddish brown, postscutellum yellowish brown. Abdomen dark brown. Genitalia fuscous. Wings hyaline, costa dark brown, the third vein nearly straight. Halteres yellowish transparent. Coxæ and femora mostly fuscous yellowish, the tibiæ and tarsi dark brown. Claws slender, strongly curved, unidentate, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment rather long, stout; terminal clasp segment stout, tapering; dorsal plate deeply and triangularly incised, the lobes narrowly rounded; ventral plate triangularly emarginate, the lobes stout, tapering. Harpes long, tapering, tuberculate. Style short, narrowly rounded.

Female.—Length 1.75 mm. Antennæ fuscous yellowish; fifteen subsessile segments, the fifth with a length one half greater than its diameter; terminal segment somewhat reduced, and partly fused with the preceding. Scutellum and postscutellum fuscous yellowish. Abdomen dark brown. The fuscous yellowish ovipositor, about as long as the body, terminal lobes rather broad, with a length about twice the diameter, narrowly rounded apically. Halteres, coxæ and base of femora pale yellowish, the distal portion of femora, tibiæ and tarsi fuscous yellowish. Other characters nearly as in the male.

Reared from flower heads of Canada thistle, *Cirsium arvense* collected by Arthur Gibson in the vicinity of Ottawa, Canada. Allied to *D. salicifolia* Felt. Type C. a2221.

Dasyneura pergandei n. sp. *Male.*—Length 1.5 mm. Antennæ dark brown or black; seventeen segments, the fifth having a stem as long as the cylindrical basal enlargement, which latter has a length one half greater than its diameter; terminal segment reduced, narrowly oval, with a length twice its diameter. Palpi; first segment subrectangular, with a length fully twice its diameter, the second a little longer, stouter, the third one fourth longer and more slender, the fourth a little longer than the third. Mesonotum dark brown, the submedian lines fuscous yellowish. Scutellum and postscutellum fuscous yellowish. Abdomen dark red. Wings hyaline, costa yellowish, the slightly curved third vein uniting therewith at the distal ninth. Halteres reddish orange. Legs reddish yellow; claws stout, strongly curved, the pulvilli as long as the claws. Genitalia obscured in the preparation.

Female.—Length 1.5 mm. Antennæ fuscous yellowish; eighteen segments, the fifth cylindric, with a length twice its diameter; terminal segment with a length twice its diameter and tapering to a subacute apex. Palpi nearly as in the opposite sex. Ovipositor when extended probably as long as the body, the terminal lobes with a length three times the diameter, tapering distally and sparsely setose.

Reared by Theodore Pergande in 1878 from swollen fruit of wild cherry collected by Prof. C. V. Riley at Glenn Ayrie, Col.

Dasyneura smilacifolia n. sp. *Male.*—Length 0.75 mm. Antennæ dark brown, with fifteen to seventeen segments, the fifth with a stem about three fourths the length of the basal enlargement, which latter has a length two and one fourth times its diameter. The terminal segment may be greatly prolonged, slender and evidently composed of two closely fused, or reduced and sessile. Palpi; first segment irregularly subquadrate, the second with a length about two and one-half-times the diameter, rounded at each extremity, the third a little longer, more slender, the fourth one half longer than the third. Mesonotum reddish brown. Scutellum, postscutellum and abdomen mostly fuscous yellowish, the latter sparsely haired. Genitalia light fuscous. Wings hyaline, costa dark brown. Halteres yellowish basally, fuscous apically. Coxæ and femora a pale straw, the tibiæ fuscous yellowish, the tarsi a light fuscous, the distal tarsal segments darker; claws slender, strongly curved, unidentate; pulvilli a little shorter than the claws. Genitalia; basal clasp segment rather long, moderately stout; terminal clasp segment stout, slightly curved; dorsal plate deeply and triangularly incised, the lobes narrowly rounded and sparsely setose; ventral plate rather short, broad, broadly rounded.. Harpes long, tapering, slightly subtruncate and irregularly tuberculate apically.

Female.—Length 0.9 mm. Antennæ dark brown; sixteen subsessile segments, the fifth with a length about twice its diameter; terminal segment reduced, subglobose. Mesonotum reddish brown. Scutellum, postscutellum and abdomen fuscous yellowish, the latter sparsely haired and in some specimens reddish orange. Ovipositor fuscous yellowish and nearly as long as the abdomen when extended; terminal lobes slender, with a length nearly four times the width, sparsely and minutely setose apically. Other characters practically as in the male.

Reared the latter part of August from rolled leaves of Smilax, (green brier) collected by Miss Cora H. Clarke at Magnolia, Mass. Allied to *D. clematidis* Felt. Type C. a2214.

Cystiphora viburnifolia n. sp. *Female.*—Length 1 mm. Antennæ pale orange; fourteen subsessile segments, the fifth with a length one fourth greater than its diameter; terminal segment reduced, narrowly oval. Palpi; first segment with

a length twice its diameter, the second and third subequal. Mesonotum brownish orange. Scutellum and postscutellum pale orange. Abdomen pale yellowish. The ovipositor short, the basal fleshy portion light orange, the distal part cultriform, sparsely setose apically. Wings rather narrow, costa pale straw. Halteres whitish transparent. Coxæ and femora mostly pale yellowish; tibiæ fuscous yellowish, the tarsi mostly dark brown; claws long, slender, evenly curved, unidentate, the pulvilli as long as the claws.

Reared from an inconspicuous elevation on the under side of the leaf of hobble bush, Viburnum, taken by Miss Cora H. Clarke at Magnolia, Mass. Superficially it resembles *Sackenomyia viburnifolia* Felt. Type C. a1897.

Asteromyia nigrina n. sp. *Female.*—Length 1.2 mm. Antennæ dark brown, the distal segments yellowish; seventeen segments, the fifth having a length about equal to its diameter; the terminal segment with a length over twice its diameter. Palpi; first segment short, irregular, the second narrowly oval, with a length about twice its diameter, the third a little longer and more slender. Mesonotum dark brown, scutellum dark reddish brown, with a few whitish scales or setæ apically; postscutellum dark brown. Abdomen a nearly uniform dark brown, almost black. Wings hyaline, costa dark brown, the third vein uniting therewith at the basal half. Halteres fuscous yellowish. Coxæ dark brown; femora, tibiæ and tarsi dark brown, the first and second segments narrowly annulate basally with whitish. Ovipositor about half the length of the abdomen; terminal lobes very broadly and irregularly oval, thickly setose.

Reared from a jar containing inconspicuous blister galls on the leaves of witch hazel, *Hamamelis virginica* collected by Miss Cora H. Clarke at Magnolia, Mass. Type C. a1780b.

Asteromyia reducta n. sp. *Male.*—Length 1.5 mm. Antennæ blackish; twelve segments, the fifth with a length about equal to its diameter; terminal segments produced, with a length two and one half times its diameter, narrowly rounded apically. Palpi uniarticulate. Mesonotum dark reddish brown. Scutellum reddish brown; postscutellum a little darker. Abdomen dark brown, the distal segments reddish; genitalia fuscous. Wings hyaline, costa dark brown, the third vein uniting with the margin at the basal half. Halteres fuscous basally, whitish apically. Legs fuscous yellowish, the distal tarsal segments lighter; claws long, moderately slender, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment moderately stout, truncate; terminal clasp segment short, swollen basally; dorsal plate deeply and triangularly divided, the lobes broadly rounded, sparsely setose; ventral plate broad, broadly rounded, sparsely setose. Halteres irregularly triangular; style short, stout, broadly rounded.

Female.—Length 1.5 mm. Antennæ with thirteen or fourteen segments, the fifth with a length about equal to its diameter; terminal segment with a length about twice its diameter, broadly rounded apically. Color characters nearly as in the opposite sex, except that the distal segments of the abdomen seem to be a more nearly uniform reddish brown. Ovipositor when extended, about half the length of the abdomen, the terminal lobes narrowly oval, with a length twice the width and thickly setose.

Reared from an irregularly oval, blackish blister gall with a diameter of 4 mm. on *Aster undulatus* collected at Magnolia, Mass., by Miss Cora H. Clarke. Type C. a2056.

Lasioptera allioniæ n. sp. *Female.*—Length 1.25 mm. Antennæ short, fuscous; sixteen segments, the fifth with a length three fourths its diameter. Palpi; the first segment short, incrassate, the second quadrate, with a length about twice its diameter, the third probably as long as the second, the fourth slender and presumably one-half longer than the third. Mesonotum dark brown, broadly margined laterally and anteriorly with short, silvery scales. Scutellum fuscous, sparsely clothed with silvery scales, postscutellum fuscous. Abdomen a nearly uniform purplish black, the first to the sixth segments with submedian, triangular, whitish spots posteriorly; venter suffused with white scales. Wings hyaline, costa dark brown, the discal spot just before the basal half, the third vein uniting with costa near the basal third. Halteres snow white. Coxæ dark brown; femora and tibiæ yellowish basally, dark brown apically; tarsi dark brown, probably banded; ovipositor yellowish, about as long as the abdomen, the lobes narrowly oval, setose.

Male.—Length 1.75 mm. Antennæ dark brown; sixteen segments, the fifth with a length about one fourth greater than its diameter, the terminal segment broadly rounded apically, with a length three fourths its diameter. Mesonotum dark brown, almost black, the submedian lines sparsely haired. Scutellum and postscutellum dark brown. Abdomen apparently nearly uniformly clothed with dark brown scales; genitalia fuscous. Wings hyaline, costa dark brown, the third vein uniting therewith near the basal half. Coxæ, femora and tibiæ fuscous yellowish, the tarsi darker; claws long, pulvilli shorter than the claws. Genitalia; basal clasp segment long, truncate; terminal clasp segment short, swollen basally; dorsal plate deeply and triangularly incised, the lobes tapering, narrowly rounded; ventral plate rather long, broadly rounded. Harpes stout, tapering; style narrowly rounded apically.

Reared from an irregular, fusiform, stem gall on Oxybaphus (Allionia) taken by Prof. E. Bethel at Boulder, Col. Type C. a2026.

Lasioptera arizonensis n. sp. *Male.*—Length 1.75 mm. Antennæ dark brown; sixteen segments, the fifth with a length one-fourth greater than its diameter; terminal segment slightly produced, broadly oval. Palpi; the first segment short, stout, the second with a length about two and one half times its diameter, the third a little longer, more slender, the fourth one half longer than the third, more slender. Mesonotum dark brown, the submedian lines thickly clothed with golden yellow scales. Scutellum and postscutellum dark brown. Abdomen dark brown, the basal segment and submedian spots on segments two to five silvery white; genitalia fuscous. Wings hyaline, costa dark brown, subcosta uniting with the anterior margin near the basal third, the third vein at the basal half. Halteres pale fuscous yellowish. Legs mostly dark brown, the apices of femora and tibiæ with the second and third tarsal segments, and the fifth and sixth tarsal segments somewhat darker; claws long, slender, strongly curved, unidentate, the pulvilli as long as the claws. Genitalia; basal clasp segment long, roundly truncate; terminal clasp segment with the basal third strongly swollen; dorsal plate short, stout, deeply and narrowly incised, the lobes broadly rounded; ventral plate long, slender, broadly rounded and sparsely setose apically. Harpes long, slender, irregularly tuberculate; style long, broadly rounded apically.

Female.—Length 2 mm. Antennæ dark brown, twenty segments; the fifth with

a length about one-fourth greater than its diameter; terminal segment produced, broadly rounded. Mesonotum shining dark brown. Scutellum reddish brown, postscutellum dark brown. Abdomen a nearly uniform dark brown, the segments narrowly margined with a few white setæ. Coxæ, femora and tibiæ a variable fuscous yellowish, slightly darker distally; tarsi nearly uniform yellowish brown. Ovipositor nearly as long as the abdomen, with conspicuous lateral basal patches of halberd-shaped scales; terminal lobe long, slender, narrowly rounded apically and with a thick dorsal group of stout, slightly recurved, chitinous spines; minor lobe short, stout.

Reared from stems of *Senecio arizonensis* taken at Oracle, Ariz., April 22, 1899. Received through U. S. Bureau of Entomology. Type C. 1062.

Neolasioptera agrostis n. sp. *Male.*—Length 1.25 mm. Antennæ light brown; probably twenty or more segments, the fifth with a length a little greater that its diameter. Palpi; the first segment irregularly subquadrate, the second narrowly oval, the third a little longer, the fourth one fourth longer and more slender than the third. Mesonotum reddish brown, sparsely clothed with short yellowish scales. Scutellum light reddish brown, postscutellum dark reddish brown. Abdomen dark brown, the dorsum of the first to the fourth abdominal segments thickly clothed with silvery white scales. Wings hyaline, costa dark brown, subcosta uniting with the anterior margin near the basal third, the third vein just beyond the basal third. Halteres whitish transparent. Legs pale yellowish; Genitalia; basal clasp segment rather long, truncate; terminal clasp segment swollen at the base, tapering; dorsal plate rather long, broad, deeply and triangularly emarginate, the lobes tapering, obliquely rounded, setose; ventral plate long, broad, tapering, narrowly rounded. Harpes long, slender, tuberculate; style long, slender, narrowly rounded.

Female.—Length 1.25 mm. Antennæ dark brown; twenty-four segments, the fifth with a length a little less than its diameter; terminal segment narrowly oval. Palpi; the first segment with a length twice its diameter, the second narrowly oval, the third one third longer than the second, the fourth a little longer. Mesonotum dark reddish brown. Scutellum yellowish apically, reddish brown basally, postscutellum dark brown. Abdomen dark brown, the basal segment thickly clothed with silvery white scales, the second to fourth segments with lunate submedian silvery spots. Tarsi dark brown; claws long, slender, unidentate, the pulvilli as long as the claws. Ovipositor nearly as long as the abdomen, the dorsum of the seventh segment with submedian irregular chitinous thickenings, terminal lobes long, stout, narrowly rounded and thickly setose. Other characters as in the male.

Reared in September from *Eragrostis minor* and loaned for study by the U. S. National Museum. Type C. 1063.

Neolasioptera squamosa n. sp. *Male.*—Length 1.25 mm. Antennæ light brown; twelve segments,the fifth with a length a little greater than its diameter, terminal segment produced, tapering to a narrowly oval apex. Palpi; the second segment narrowly oval, the third longer, stouter, the fourth with a length more than twice the third. Mesonotum reddish brown, the submedian lines very thickly clothed with divergent yellowish white scales. Scutellum and postscutellum pale yellowish. Abdomen apparently a yellowish brown, with rudimentary submedian silvery markings; genitalia pale yellowish. Wings hyaline, rather long, narrow, costa dark brown, subcosta uniting with the anterior margin near the basal third, the third vein at the

long, white discal spot on the basal half. Halteres pale yellowish. Coxæ and the femora mostly pale yellowish; tibiæ and tarsi dark brown except that the first tarsal segment and the extremities of the others, except the distal one of the fifth are rather broadly banded with yellowish white; claws long, slender, unidentate, the pulvilli nearly as long as the claws. Genitalia; basal clasp segment long, roundly truncate; terminal clasp segment swollen basally, tapering, obtuse apically; dorsal plate long, broad, narrowly incised, the lobes broadly rounded; ventral plate long, slender, rounded. Harpes short, stout, tapering, obtuse; style rather short, stout, rounded.

Reared from grass (presumably a gall) taken August 11, 1891 at Cadet, Mo. and loaned for study by the U. S. National Museum. Type C. 909.

Neolasioptera trimera n. sp. *Female.*—Length 1.5 mm. Antennæ dark brown, sparsely haired, twenty-one segments, the fifth with a length about one half its diameter, the last segment broadly oval. Palpi; first segment short, stout, irregular, the second almost subglobose, broadly oval, the third nearly twice the length of the second, slender. Mesonotum dark brown, the submedian lines sparsely haired. Scutellum reddish brown, postscutellum a little darker. Abdomen a nearly uniform dark brown, the segments very sparsely margined posteriorly with a few whitish hairs. Wings hyaline, costa dark brown, the third vein uniting with costa near the basal half, discal spot large. Halteres yellowish white. Legs a nearly uniform reddish brown; claws unidentate, the pulvilli nearly as long as the claws. Ovipositor yellowish, about half the length of the body; terminal lobes narrowly oval, thickly clothed with stout setæ.

Reared from a stem gall on sunflower taken at Fort Grant, Ariz., and loaned for study by the U. S. National Museum. Type C. 907.

Rhopalomyia gnaphalodis n. sp. *Female.*—Length 2 mm. Antennæ reddish brown; seventeen or eighteen subsessile segments, the fifth with a length about two and one half times its diameter; terminal segment slightly produced or fused with the preceding. Palpi; first segment short, subglobose, the second narrowly oval. Mesonotum shining reddish brown. Scutellum reddish brown, postscutellum darker. Abdomen sparsely haired, deep reddish, the basal segment darker. Costa pale straw. Halteres yellowish. Coxæ reddish brown; femora fuscous yellowish; tibiæ reddish, darker apically; tarsi reddish brown; distal tarsal segments missing in specimen; the fuscous yellowish ovipositor stout, nearly as long as the body, the lobes narrowly oval, sparsely setose.

Reared by Prof. T. D. A. Cockerell, Boulder, Col., from a woolly, polythalamous gall, diameter 1 cm., on *Artemisia gnaphalodes.* Type C. 1382.

(*To be continued.*)

DUTCH INSPECTION SERVICE

The following communication was received by Dr. L. O. Howard, at whose suggestion it is published.—*Ed.*

WAGENINGEN, Sept. 6th, 1911.

DEAR SIR:

Since this summer not only my oldest chief assistant, Dr. Quanjer, but also my second chief assistant, Mr. van Poeteren, is appointed by our Government for acting as substitute chief of the phytopathological service in my absence; he can also put his signature on the certificates. It seems to me necessary to send you now the signature of him. On the accompanying cards I have brought together the signatures of both my chief assistants who have been appointed as my substitutes, and of myself, and I should feel myself very much obliged to you if you would be so kind as to send those cards to those entomologists, horticultural commissioners, inspectors, etc., in the different States who are charged with the inspection of the packages with shrubs, trees and plants which are sent from the Netherlands to the United States of America. When it is good to send you more of those cards I shall do so.

I take the liberty to invoke your help, for I do not know the names of the different gentlemen to whom they ought to be sent.

I hope that I do not intrude too much on your kindness, and beg you to accept my most respectful thanks for what you will do for me and for our phytopathological service. It shall be a great favor for me when I can help you in return in something.

With very kind regards,

Yours truly,

J. RITZEMA BOS.

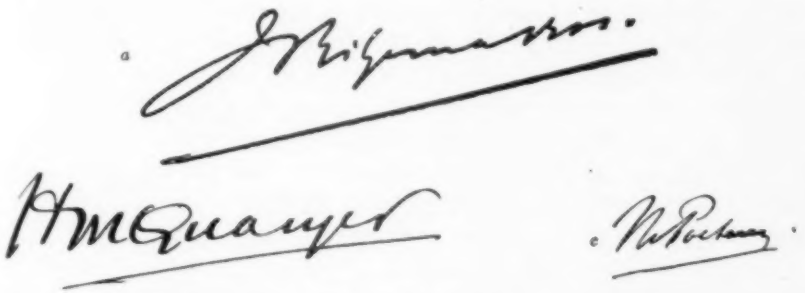


Fig. 12. Facsimiles of signatures: *a* Prof. J. Ritsema Bos; *b* H. M. Quanjer; *c* N. van Poeteren.

CORRECTION

Read lines 4 and 3 from the bottom of page 385 and after the word "preceding," as follows: "22 and 22a, *Mac. pisi*, 23, apterous female of same; 24 and 25, *Mac. ambrosiæ;* 26 and 26a, *Mac. sanborni.*" Because of too great reduction in the dimensions of Plate 16, all amplifications are three fourths as great as indicated on the plate.

C. P. GILLETTE.

JOURNAL OF ECONOMIC ENTOMOLOGY

OFFICIAL ORGAN AMERICAN ASSOCIATION OF ECONOMIC ENTOMOLOGISTS

OCTOBER, 1911

The editors will thankfully receive news items and other matter likely to be of interest to subscribers. Papers will be published, so far as possible, in the order of reception. All extended contributions, at least, should be in the hands of the editor the first of the month preceding publication. Reprints may be obtained at cost. Contributors are requested to supply electrotypes for the larger illustrations so far as possible. The receipt of all papers will be acknowledged.—EDS.

It is planned to issue the next number of the Journal December 1st instead of on the 15th as heretofore. This change was made so that the program for the annual meeting, usually published in the last number, will be in the hands of the majority of our readers at least two weeks before the time of the meeting. Furthermore, the mailing of this issue about the 15th is frequently followed by delay incident to the accompanying rush of Christmas mail. Contributors are therefore requested to forward copy to the editor by the 1st of November, though minor notices may be inserted if received by the 11th. We hope the change for this number will meet with general approval.

The recent circular (No. 27 of the U. S. Department of Agriculture) sent out over the signature of the Secretary of Agriculture is a comprehensive and moderate statement of the need for an efficient national quarantine law applying to nursery stock and plants or plant products entering into international and interstate commerce. This circular should be widely disseminated and ought to have a most beneficial influence in developing a proper attitude toward such an enactment. A law of this general character would be of inestimable value in the case of sporadic infestations such, for example, as the recently discovered presence of the gipsy moth at Lenox, Mass. The insect was in all probability brought into that locality with nursery stock, judging from the evidence available. There is no reason why similar infestations might not occur in other states and in that event it would very probably be in less progressive communities. In some instances at least, authority such as this proposed law gives would be almost necessary for the proper handling of the situation. This is a matter of vital importance to almost every tax payer in the northeastern United States at least, because unless such infestations are handled in a summary manner, it would soon mean an enormous local tax for the control of pests in unfortunate communities here and there. Experience in eastern Massachusetts has shown that such assessments may

run as high as $10,000 annually in cities with thirty to forty thousand inhabitants. This is only one instance of the marked benefits which might result from such an enactment. It would surely appear as though all fair minded citizens would recognize the necessity for such protection even though it might mean unfortunate restrictions in the case of a few. A most effective method of conserving our natural resources is to exclude or check the spread of destructive natural agents which may either cause enormous losses on account of the direct injury inflicted or necessitate heavy taxation if efficiently controlled.

Current Notes

Conducted by the Associate Editor

Mr. Alfred B. Champlain, assistant in entomology at the Connecticut Agricultural Experiment Station, resigned, October 1, to accept a new position in the Division of Economic Zoölogy at Harrisburg, Pa., where he was formerly employed. In the future Mr. Champlain will have charge of the insectary and the breeding work of the Division.

Forest Insect Station No. 5 has been established at Yreka, Calif., by the Division of Forest Insect Investigation of the Bureau of Entomology, U. S. Department of Agriculture. Mr. H. E. Burke is in charge, and is assisted by Agents A. G. Angell, J. J. Sullivan and J. B. Riggs.

Prof. E. D. Sanderson, Dean of the College of Agriculture of West Virginia University, has also been appointed Director of the Experiment Station, to succeed J. H. Stewart, who has recently resigned. The new appointment takes effect Jan. 1, 1912.

E. G. Titus received at Commencement time the degree of Doctor of Science from Harvard University, where he has been studying for the past year, and he has since been made professor of entomology at the Utah Agricultural College.

According to an announcement in Science, plans are now being made for a new entomology building at Rutgers College, New Brunswick, N. J., the same to be two stories high and to contain class rooms and museum, as well as space for Experiment Station work.

Dr. Creighton Wellman, formerly professor in the laboratory of Tropical Medicine at Oakland, California, and a student of the Coleoptera, has been appointed to a regular professorship at Tulane University, New Orleans, La.

Mr. Wesley O. Hollister, a graduate of the Connecticut Agricultural College at Storrs, has recently accepted a position with Parke, Davis & Co., Detroit, Mich. He will have charge of field tests with insecticides and preparing exhibit sets of injurious insects.

Mr. E. P. Hoff, assistant entomologist of the Utah Agricultural Experiment Station, resigned September 1st to go into commercial work, and has been succeeded by a graduate of the local college, Mr. M. A. Nelson.

Mr. W. M. Ball, a graduate of the Department of Entomology, Utah Agricultural College, has begun work on an elaborate and extensive test of arsenical poisons for the U. S. Smelting Co. of Salt Lake City.

E. W. Stafford, a graduate of the Ontario Agricultural College, has been appointed assistant in entomology at the New Jersey Agricultural Experiment Station.

H. B. Scammel has been appointed assistant entomologist at the Minnesota Agricultural Experiment Station, and has entered upon his duties.

The New Jersey State Entomologist has been authorized by the State Board of Agriculture to investigate problems relating to the foul brood diseases of bees.

Mr. James F. Zimmer, Bureau of Entomology—Deciduous Fruit Insect Investigations; Washington, D. C., goes on leave September 20th in order to take graduate work, in Entomology, at Cornell University, Ithaca, N. Y.

H. R. Niswenger and H. H. Jewett have been appointed assistant entomologists and botanists at the Kentucky Agricultural Experiment Station.

The Legislature of Ohio has appropriated $13,600 to the Agricultural Experiment Station for entomology during the biennial period of 1911 and 1912.

At the Oregon Station, A. L. Lovett has been appointed field assistant and H. E. Ewing laboratory assistant in entomology.

W. V. Tower has resigned as entomologist of the Porto Rico Experiment Station to accept a position with the Porto Rico Board of Agriculture.

A. C. Burrill has been appointed assistant in economic entomology at the University of Wisconsin.

Mailed October 16, 1911.